AQUA LUNG®

Military & Professional Operations

PHODS

Portable Helicopter Oxygen Delivery System



Technical Manual

Rev. 01/11

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Portable Helicopter Oxygen Delivery System (PHODS)
Technical Manual P/N 103047
PHODS P/N 102935

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NOTICE OF NON-LIABILITY

Before the Portable Helicopter Oxygen Delivery System (PHODS) is put to use, it is the responsibility of any user who will use this device to become familiar with the operation and safety aspects of this device. Using the system improperly could cause failure and lead to possible property damage and/or personal injury.

Aqua Lung America assumes no responsibility for property damage, accidents, injury or death that may result from the misuse of this device or equipment. This includes any use of this device or equipment outside the scope of common sense, the Instruction Manual, inserts and other related documentation. *(Portions of this manual are excerpts from: the MH OPC M1 Instruction Manual, used by permission of Mountain High Equipment & Supply Company®, Redmond, OR.; from the PHODS Mask Assembly Manual, used by permission of GENTEX Corporation- Respiratory Products®, Rancho Cucamonga, CA.; and from the MOCRS Manual, used by permission of Oxygen Generating Systems Intl.®, N. Tonawanda, NY.)*

WARNINGS, CAUTIONS AND NOTES

Pay special attention to information provided in warnings, cautions, and notes which are accompanied by these symbols:

A **WARNING** indicates a procedure or situation that may result in serious injury or death to the user.

A **CAUTION** indicates any situation or technique that will result in potential damage to the product.

*A **NOTE** is used to emphasize important points, tips, and reminders.*

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CHANGE RECORD

Change No.	Date	Title or Description	Change made by
01-09	08/13/09	PG 8 &13. Added WARNING for Nitrogen Purge. Para. 1. Added Nitrogen purge option Pg. 23 Nasal Cannula Mounting, para 1 insert "instructions provided on pg. 51" Pg. 10 & 32 Add "***NOTE:*** *The standard Maxillofacial Shield may be converted for use with the PHODS mask system by following the instructions on page 50 of this manual* " Pg. 50 Add procedure to modify MFS to PHODS Mask use. Pg. 51 Add new procedure to attach Cannula Clip to Helmet	Aqua Lung
02-09	10/06/09	Pg 28 Fig 43 Change # RM to read " increases consumption at all altitudes"	Aqua Lung
01-10	04/29/10	Pg 32 Added "Ports can be reversed to accomodate right or left side installation of the PHODS inlet hose." Pg 58 Replaced upper tool tray picture to reflect new tool. Add Retainer Installation Tool to Tool list. Pg. 64 Added Appendix A - PHODS Mask maintenance	Aqua Lung

BASIC SAFETY

Pure oxygen is a highly oxidizing gas and can vigorously accelerate combustion. It can provide a catalyst for spontaneous combustion resulting in personal injury or death if not used properly and with caution.

DO NOT use any type of oil or grease on any of the fittings, valves or cylinders. DO NOT smoke while in use. DO NOT operate near an open flame.

General Precautions & Warnings

WARNING - This device is classified as, and is only suitable for use as, a supplementary breathing apparatus (SBA) for aviation use up to 18,000 ft. MSL. It is intended to supply the needed amount of oxygen for persons during excursions at flight altitudes where supplemental oxygen is needed. This device is not suitable for any type of medical operations. This device is not suitable for SCBA (Self Contained Breathing Apparatus) or SCUBA (Self Contained Underwater Breathing Apparatus) operations.

WARNING - When operating the PHODS around high power emitters such as friendly or threat systems, PHODS may stop providing oxygen, or may start pumping oxygen when not expected or required. If the unit is not operational, turning the OPC M1 power OFF then ON will be required. An operational check must therefore be performed immediately prior to use at high altitudes.

WARNING - Before using the PHODS, it is important to receive hypoxia awareness and aeromedical training. Use of the PHODS without proper training is dangerous and can result in serious injury, or death.

WARNING - DO NOT apply any type of petroleum-based lubricant or grease to any part of the PHODS. Hydrocarbon contamination, including petroleum-based lubricants, can cause spontaneous combustion when exposed to compressed oxygen.

WARNING - It is important to fill the PHODS cylinder only with Oxygen 90% pure or greater. If filling the PHODS from any other source than a Mobile Oxygen Cylinder Recharge Station, ensure that the moisture content does not exceed 0.005 milligrams of water vapor per liter of gas at 760 millimeters of mercury (mmHg) at a temperature of 70ºF / 21.1ºC. Excess water vapor in the breathing gas can cause ice to form inside the PHODS and interfere with the operation of the system at colder temperatures.

WARNING - Do not attempt to loosen or remove the regulator Q. D. connector or safety burst plug on the regulator under any circumstances. This should only be done by a qualified technician.

WARNING - The OPC M1 LED is Night Vision Goggle (NVG) compatible and therefore difficult to see through the NVG. The LED should be viewed with the unaided eye. The OPC M1 should be mounted on the Survival Vest in a location that will allow direct viewing of the LED indicator light. The LED should be periodically checked to ensure proper operation during flight at altitudes requiring supplemental oxygen.

WARNING - Crew members are required to periodically check the amount of oxygen remaining in their PHODS cylinder.

WARNING - PHODS oxygen cylinder may burst from impact of small arms fire, resulting in overpressure shock, shrapnel injury and/or flash fire.

WARNING - The OPC M1 does not provide an indication of remaining battery life. Ensure new batteries are installed in the PHODS during Pre-flight.

WARNING - Failure to breathe properly through the nose while using the cannula may result in oxygen deprivation.

WARNING - DO NOT modify or alter the length of any hoses or tubing. This should only be done by a qualified technician, using original manufacturer hose assemblies.

WARNING - Disinfect the PHODS Mask or Nasal Cannula & Nose Piece after each use to avoid bacteriological contamination and for cleanliness. Cleaning can be accomplished with isopropyl alcohol.

WARNING - Oxygen should be delivered to the inlet port on the side of the mask with the inhalation valve to ensure proper dilution of the oxygen with the ambient air in the mask cavity.

WARNING - DO NOT increase or decrease the length of the Nasal Cannula or the coiled hose. The removable Nose Piece may be trimmed for comfort.

WARNING - If after consulting the Troubleshooting section of this manual the situation is not resolved, immediately return the PHODS system to a qualified technician for inspection.

WARNING - DO NOT fill or use the PHODS if it has been exposed to extreme heat exceeding 250°F/ 121ºC, or open flame. Instead, discharge the cylinder completely and return it to a qualified technician for inspection and possible hydrostatic testing.

WARNING - DO NOT attempt to overfill the PHODS beyond 2100 psi / 145 bar at 70ºF/ 21ºC. Doing so may seriously weaken the cylinder and cause it to rupture, resulting in serious injury or death.

WARNING - DO NOT attempt to fill the PHODS if the cylinder markings indicate that it is assembled with a nonstandard cylinder rated for a different fill pressure than 2,100 psi / 145 bar. Doing so may result in rupture or explosion in the event of fire or overfilling. Instead, immediately return the unit to a qualified technician and do not use under any circumstances.

WARNING - DO NOT attempt to fill the PHODS from a supply cylinder which is not regulated to 2,100 PSI / 145 BAR. Doing so may weaken and damage the safety burst plug assembly and/or PHODS cylinder.

WARNING - If Nitrogen is used to purge the PHODS for storage, failure to properly purge the Nitrogen out before use may lead to Hypoxia and possible death. Units must be Tagged and segregated from operational units to prevent accidental use.

WARNING - Disinfect oxygen mask after each use to avoid bacteriological contamination and for cleanliness (Ref. paragraph 4.12).

WARNING - An improperly fitted mask could result in a loss of altitude protection and possible injury to the wearer.

WARNING - Wear eye-protective goggles when drilling holes in Steps 9-11 to prevent eye injury. Use the 2x4 block of wood as described in Steps 9-11 to prevent hand injury.

WARNING - Wear eye-protective goggles when drilling holes in Steps s and t to prevent eye injury. Use the 2x4 block of wood as described in Steps s and t to prevent hand injury.

WARNING - Wear eye-protective goggles when trimming the MFS, or chips of the MFS may injure the eyes. Wear a respirator when trimming the MFS, or harmful airborne particles may be inhaled.

WARNING - When using the anti-fogging solution described below, avoid getting the liquid solution into the eyes. Solution will irritate and may burn the eyes. In case of eye contact, flush with fresh water for 15 minutes. Contact physician if irritation persists. See package for other directions.

WARNING - Disinfect oxygen mask after each use to avoid bacteriological contamination and to ensure maximum cleanliness.

WARNING - DO NOT use clothes washing detergents of any kind, i.e., Tide®, Cheer®, or All® for cleaning oxygen masks. Isopropyl alcohol may be used only where, and as, specified in this document.

WARNING - Isopropyl alcohol is flammable. Keep away from heat, sparks, and open flames. Use with adequate ventilation. Avoid eye and repeated skin contact. Avoid prolonged breathing of vapors. Keep container closed when not in use.

CAUTION - When donning the flight equipment, ensure all PHODS straps and hoses are properly secured to the Survival Vest to prevent snagging during egress.

CAUTION - DO NOT apply any type of aerosol spray to the PHODS. Doing so may cause permanent damage to certain plastic components, including the delivery tubing.

CAUTION - PHODS operation has not been verified below -25ºF and performance may be degraded at lower temperatures.

CAUTION - DO NOT pull on the tubing without pushing in the collar; it will damage the connector.

CAUTION - DO NOT pinch the outlet hose when inserting it into the “Out” connector.

CAUTION - If moisture is found to be present inside the fill port opening, indicating that water may have entered the PHODS first-stage and cylinder, DO NOT fill or attempt to use the PHODS until it has received complete inspection and any required service by a qualified technician.

CAUTION - Be careful not to damage any components inside the helmet when performing Steps 9-11.

CAUTION - Be sure to drill the helmet shell as specified in Steps 9-11, or delamination of the helmet shell could result, making the helmet unserviceable. When performing Steps 9-11, hold the drill perpendicular to the helmet shell to prevent damage to the shell and the energy-absorbing liner. Use the 2x4 block of wood as specified in Steps 9-11 to prevent damage to the helmet shell.

CAUTION - Be careful not to damage any components inside the helmet when performing Steps s and t. Be sure to drill the helmet shell as specified in Steps 19 - 20, or delamination of the helmet shell could result, making the helmet unserviceable. When performing Steps 19 and 20, hold the drill perpendicular to the helmet shell to prevent damage to the shell and the energy-absorbing liner. Use the 2x4 block of wood as specified in Steps 19 and t to prevent damage to the helmet shell. When performing Step 20, ensure that both strikers are rotated out of the way before you begin drilling. Do not drill through the strikers with the 3/16-inch drill bit.

CAUTION - Dust and dirt can easily foul the operation of the valve assemblies. Keep the oxygen mask inside a sealed plastic bag or suitable container until ready for use.

CAUTION - DO NOT probe into any portion of the valves with swabs or other tools.

CAUTION - DO NOT under any circumstances use any type of organic solvent (MEK, TCE, etc.) to clean any portion of the mask, valves, or other components.

CAUTION - Carefully align slots on the valve with the two small key tabs on the hardshell port. Damage can occur if not done properly.

NOTE -*The OPC M1 unit is programmed to start operation once it senses a pressure altitude of 8,000 ± 500 ft. PA. Due to the differences in barometric pressures and other factors where the unit may be operating, the OPC M1 is guaranteed to start operation at and over 10,000 ft.PA.*

NOTE - *If the OPC M1 is not going to be used for 30 days or more, remove the batteries. When using the OPC M1 for the first time after storage, replace the batteries to ensure proper operation. A fresh set of batteries should be part of your pre-flight inventory.*

NOTE - *DO NOT store the OPC M1 connected to the cylinder while the inlet is under pressure. If the lines are disconnected the ends must be covered to prevent the entry of debris, dust or dirt into clean hoses.*

NOTE - *Before proceeding, review the information on the back panel of the unit, which provides an easy reference for the various operation modes (See Fig.37).*

NOTE - *The OPC ON mode is designed to provide the amount of oxygen needed by an average size healthy person using a cannula at the given altitudes; your needs may be different.*

NOTE - *Batteries fit tightly, handle with care. (See Page 48).*

NOTE - *If wearing the HGU-56/P Helmet, the OPC M1 should be worn on right front chest; cylinder should be worn on right kidney. If wearing the IHADSS Helmet, the OPC M1 should be worn on the left front chest; cylinder should be worn on left kidney.*

NOTE - *The unit should not be stored with oxygen in the cylinder. Instead, store with oxygen compatible air or dry nitrogen. When put back into service, be sure to purge the cylinder and regulator prior to filling with oxygen for use.*

NOTE - *Factory prescribed service for the PHODS must only be performed by a qualified technician.*

NOTE - *Upon receipt of new PHODS from Aqua Lung America, ensure that the oxygen clean compressed air used in shipping is purged from the PHODS cylinder prior to filling with oxygen.*

NOTE - *Always fill the cylinder as slowly as possible by turning the handwheel of the supply valve slowly to control the rate of fill. Rapid filling will generate heat and will result in an incomplete fill after the cylinder cools. If the cylinder is warm to the touch afterward, the fill rate was too rapid and cylinder needs to be topped off.*

NOTE - *For more specific information on the MOCRS system, please refer to the user manual.*

NOTE -*The MOCRS takes about 25-30 hours to fill a K cylinder from empty depending on the altitude.*

NOTE - *The PHODS system does not include a cylinder fill adapter. This adapter (PN 102911) may be purchased separately.*

NOTE - *The PHODS regulator and cylinder is shipped with approximately 40 psi of oxygen compatible air. This is to ensure moisture does not enter the system during shipment and/or storage.*

NOTE - *When charging the PHODS cylinder, DO NOT exceed 200 psi per minute charging rate.*

NOTE - *Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

NOTE - *While the regulator dial gauge indicates a full cylinder on the ground, the colder temperatures at higher altitudes will reduce the pressure in the cylinders. This is normal. At higher altitudes, Aircrew members must check the cylinder pressure in the user worn cylinders more often.*

NOTE - *The unit may be charged with the valve closed, however the gauge will not indicate any pressure. This mode is not recommended.*

NOTE - *The standard Maxillofacial Shield may be converted for use with the PHODS mask system by following the instructions on page 52 of this manual*

NOTE - Ensure exhalation valve (6) is returned to the proper hole of the facepiece. Valve should be opposite from PHODS OPC inlet fitting (D) in use.The soft rubber facepiece (2) acts as the gasket for sealing the valve. Ensure the facepiece material is not pinched between the valve threads and the hardshell (3).

NOTE - *Proper helmet fit is essential to ensure proper mask seal and comfort.*

NOTE - *The buckles on the mask should be tacked to prevent movement. Tacking thread showing no wear between inspections is considered satisfactory.*

NOTE - *Assuming that the mask is assigned to a single wearer, after the mask has been flown and a comfortable fit has been achieved, cut the excess strap length leaving not less than one inch and not more than three inches. Heat-sear the cut ends to prevent unraveling. The straps may be folded under if desired before tacking. Tack with two turns of thread. Tacking shall be of doubled waxed thread, Specification V-T-276, Type IV, Size B, ticket 8/4 (NSN 8310-01-063-5934) or equal. Make two turns through the adjustment buckle (Ref. Figure 4-2). Tie the tacking thread with a surgeon's knot and secure with a locking knot.*

NOTE - *The helmet can be donned or doffed while the MFS is attached to either side and swung open. However, if the ML-24 light (from Seitz Scientific Industries, Inc.) is attached to the MFS, the MFS should be swung open from the right side as worn to avoid disconnecting the light. The MFS can also be swung open while the helmet is worn, allowing the crewmember to eat or drink. If the helmet is stowed with the MFS attached, the shield should be secured to the helmet on both sides.*

NOTE - *Prior to donning the helmet in Step 23, clean the inside of the helmet to remove all debris resulting from drilling.*

NOTE - *Trim the MFS with the edge beading left in place. You will cut through the edge beading and the shield. Trim no more than necessary to allow the night vision goggles to clear the MFS.*

NOTE - *Replace the abrasive band of the sanding drum on the rotary tool as necessary.*

NOTE - *The helmet can be donned or doffed while the MFS is attached to either side and swung open. However, if the ML-24 light (from Seitz Scientific Industries, Inc.) is attached, the MFS should be swung open from the right side as worn to avoid disconnecting the light. The MFS can also be swung open while the helmet is worn, allowing the crewmember to eat or drink. If the helmet is stowed with the MFS attached, the shield should be secured to the helmet on both sides.*

NOTE - The 103022 thru 103025 masks use the modified M-169A/AIC 5-ohm microphone.

NOTE - Removal of Quick Change Striker assemblies during periodic maintenance is not necessary unless part replacement is required.

NOTE - Ensure exhalation valve (6) is returned to the proper hole of the facepiece. Valve should be opposite from PHODS OPC inlet fitting (D) in use.The soft rubber facepiece (2) acts as the gasket for sealing the valve. Ensure the facepiece material is not pinched between the valve threads and the hardshell (3).

NOTE - Ensure that the valve covers are properly installed on the valve nuts. An improperly installed valve cover may cause the cover to separate from the valve nut.

If you have any questions or do not understand the information in these Warnings, Cautions, and Notes, please contact an Aqua Lung America Technical Advisor before proceeding.

SYSTEM DESCRIPTION

BASIC PHODS SYSTEM (Fig. 1)

The Portable Helicopter Oxygen Delivery System (PHODS) is a man-mounted oxygen delivery system that can be attached directly to a crew member's Survival Vest and helmet to support flight and ground missions at high altitudes. The 3 main components of the basic system are: (1) a regulator and oxygen cylinder; (2) an automatic oxygen pulse controller (OPC M1) with inlet and outlet hoses; (3) a flexible nasal cannula with a Q.D. coiled hose assembly. The oxygen cylinder is a Department of Transportation (DOT) certified steel cylinder that is placed in a pocket made from fire resistant material that is attached to the crew member's Survival Vest. Oxygen is delivered from the cylinder via a regulator to the OPC M1 unit powered by 2 AA batteries. The OPC M1 automatically provides a predetermined amount of oxygen when it senses a pressure differential caused by the user's breathing and contains an internal barometer that detects changes in altitude. When the system is turned on, it will become active at 8,000 ± 500 feet (ft.) pressure altitude (PA) and will start to deliver measured quantities of oxygen to the crew member between 8,000 ft. PA to 10,000 ft PA. The OPC M1 will continue to deliver oxygen up to 18,000 ft. MSL. When the aircraft altitude drops below 8,000 ± 500 ft. PA, the unit will de-activate. A PHODS mask may be used in lieu of the nasal cannula when operational and individual physiology conditions dictate. However, the mask is not recommended for routine high altitude operations since this configuration will consume the limited quantity of oxygen provided by the basic PHODS at an increased rate. PHODS has been tested and approved for use on US Army Chinook (CH-47), Blackhawk (UH-60) and Apache (AH-64) aircraft.

☞ *NOTE -The OPC M1 unit is programmed to start operation once it senses a pressure altitude of 8,000 ± 500 ft. PA. Due to the differences in barometric pressures and other factors where the unit may be operating, the OPC M1 is guaranteed to start operation at and over 10,000 ft.PA.*

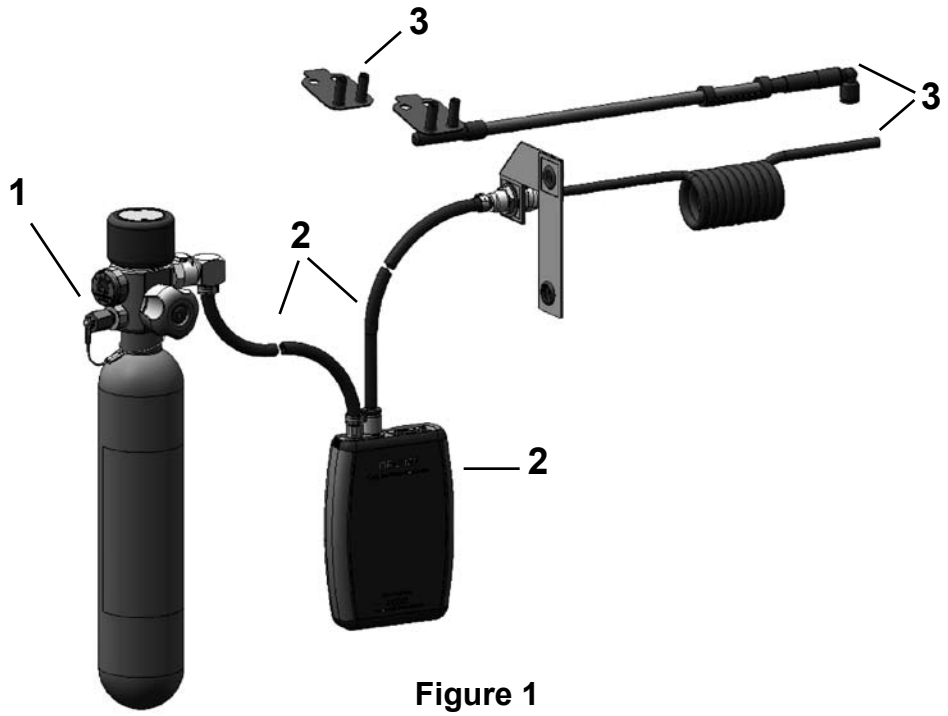


Figure 1

Regulator and Oxygen Cylinder (Figs. 2-4).

1. Piston regulator with integral Fill Port and Dial Gauge Indicator.
2. Regulated fixed output 15-25 psi with on/off valve. Quick Disconnect (Q.D.) connector for rapid cylinder change-out while in flight.
3. Installed Safety Plug for emergency overpressure relief.
4. Military black with minimal chrome parts.
5. Green 1.7 cubic ft. cylinder.

Figure 2

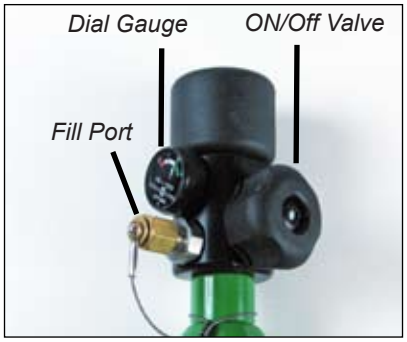


Figure 3

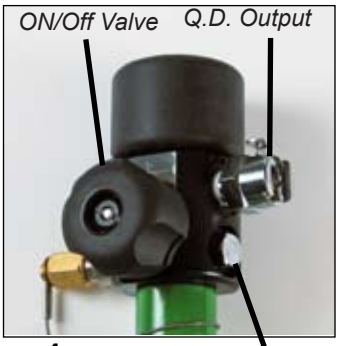


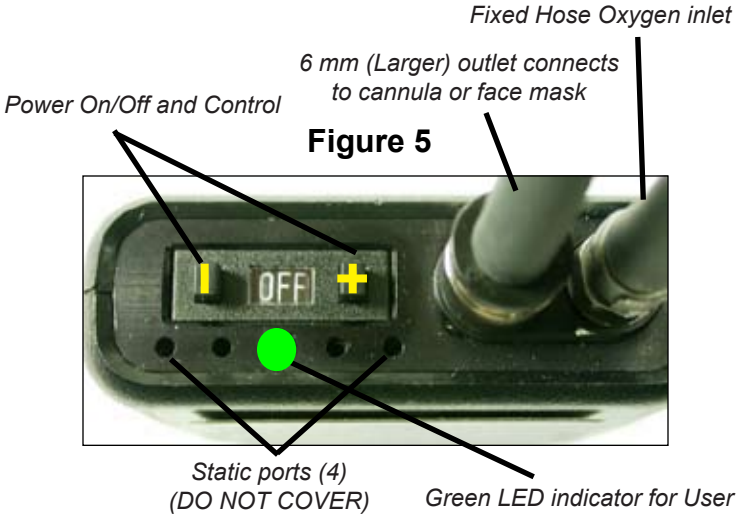
Figure 4



Oxygen Pulse Controller (OPC M1) (Fig. 5).

1. Easy-to-use two-button ON-OFF control switch, small size and light weight.
2. Preset to supply oxygen.
3. Automatically adjusts oxygen flow with altitude.
4. Provides reduced oxygen consumption through more efficient oxygen delivery.
5. Push button control switch allows multiple oxygen delivery schedules based on workload and altitude challenges.
6. Green LED indicates oxygen flow, alarm, battery status and informs user of kinked, pinched or disconnected lines, obstructed cannula or mask.

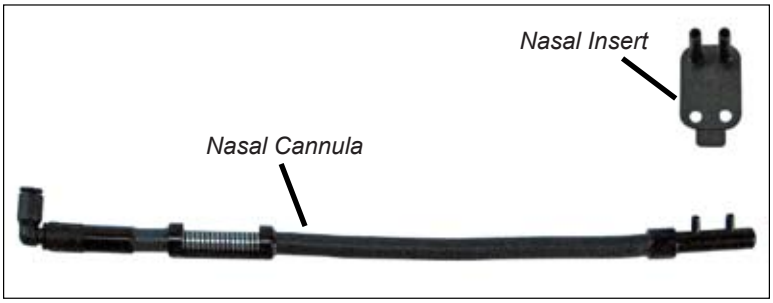
Figure 5



Nasal Cannula (Fig. 6).

1. Delivery of oxygen via nasal cannula is an efficient and effective use of a limited O_2 quantity.
2. Uses a flexible, helmet mounted boom.
3. Can be mounted to both the HGU-56P and the Apache Integrated Helmet And Display Sight System (IHADSS) helmets.
4. Can be easily removed from helmet mount while in flight.
5. Uses easy replaced/maintained soft rubber nasal inserts that can be trimmed to fit individual nasal passages.

Figure 6



PREPARATION AND SETUP

The purpose of this manual is to familiarize you with the correct setup, filling, inspection, and user maintenance of the PHODS.
The PHODS is packaged with the major components fully assembled and ready to use after it has been filled with Oxygen. Before using it, however, it is very important to carefully read and understand the procedures outlined in this manual for filling the unit and performing a preflight inspection.

PHODS Purge Procedure

> ***NOTE*** *- Upon receipt of new PHODS from Aqua Lung America, ensure that the oxygen clean compressed air used in shipping is purged from the PHODS cylinder prior to filling with oxygen.*

> ***NOTE*** *- The PHODS regulator and cylinder is shipped with approximately 40 psi of oxygen compatible air. This is to ensure moisture does not enter the system during shipment and/or storage.*

> **WARNING -** If Nitrogen is used to purge the PHODS for storage, failure to properly purge the Nitrogen out before use may lead to Hypoxia and possible death. Units must be Tagged and segregated from operational units to prevent accidental use.

1. Upon initial receipt, if the system has been breathed down to ZERO psi and contamination may be suspected or after the annual regulator overhaul, the PHODS regulator and cylinder will need to be purged prior to use. This will remove air from the unit and replace it with breathable oxygen or oil free nitrogen for storage (must be tagged and identified when purged with Nitrogen).
2. Remove the PHODS cylinder and regulator from packaging (initial receipt).
3. Inspect the unit for any damage.
4. Remove the charging adapter cap. Inspect the charging adapter for dirt, debris or oil. If present, return the unit to the technician for cleaning.
5. In accordance with local procedures, connect the oxygen supply to the PHODS cylinder and regulator charging adapter.
6. Connect the intermediate pressure (IP) gauge to the Quick Disconnect (QD) on the PHODS regulator.
7. Open the PHODS regulator valve.

> ***NOTE*** *- When charging the PHODS cylinder, DO NOT exceed 200 psi per minute charging rate.*

8. In accordance with local procedures, SLOWLY charge the PHODS cylinder with 500 psi of oxygen. Secure the oxygen charge.
9. Using the vent valve on the IP gauge, vent the oxygen from the cylinder SLOWLY until the dial gauge on the PHODS regulator reads 0 psi and no pressure is venting out. Close the vent valve.
10. Again, SLOWLY charge the PHODS cylinder with 500 psi of oxygen. Secure the oxygen charge.

> ***NOTE*** *- Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

11. Using the vent valve on the IP gauge, vent the oxygen from the cylinder SLOWLY until the dial gauge on the PHODS regulator reads 0 psi and no pressure is venting out. Close the vent valve.
12. Remove the IP gauge.
13. Charge the cylinder with 2100 psi of oxygen. Close the PHODS regulator valve.
14. In accordance with local procedures, secure the oxygen charge and remove the charging connection.
15. Install the charging adapter cap, hand tight.
16. Return the PHODS regulator and cylinder to the case.
17. The PHODS regulator and cylinder is ready for issue.

Filling Procedures - General

1. Before attempting to fill the PHODS, ensure that the fill adapter and first-stage are completely dry and free of contaminants- especially in the area surrounding the high pressure port.
2. Examine the cylinder markings to verify that it is rated for a fill pressure of 2,100 psi / 145 bar **(Figs. 7 & 8).**

Cylinder Identification

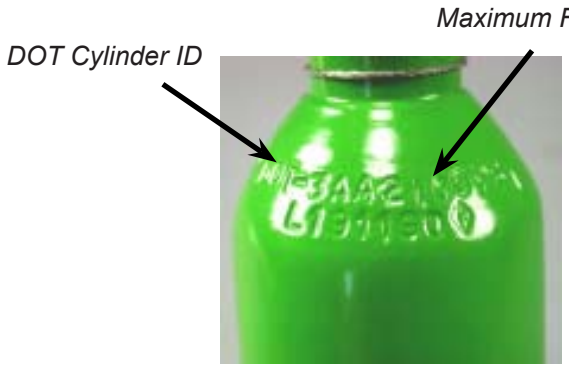


Figure 7

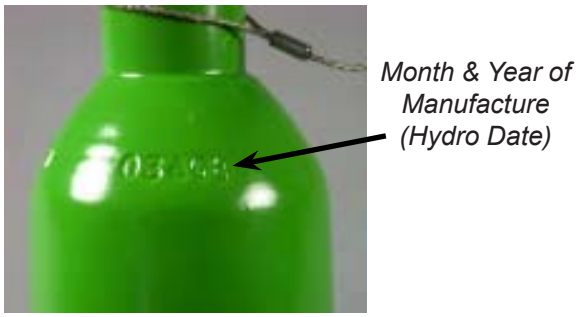


Figure 8

WARNING - DO NOT attempt to fill the PHODS if the cylinder markings indicate that it is assembled with a nonstandard cylinder rated for a different fill pressure than 2,100 psi / 145 bar. Doing so may result in rupture or explosion in the event of fire or overfilling. Instead, immediately return the unit to a qualified technician and do not use under any circumstances.

3. Disconnect the OPC supply hose by depressing lever of the Q.D. connector on the bottle regulator **(Fig. 9).**



Figure 9

4. Turn the valve handwheel counterclockwise until it is completely open (“ON” position). To ensure the valve is open, verify that the red the indicator ring is not visible through the slot in the handwheel. **(Figs. 10 &11)**

> ***NOTE*** *- The unit may be charged with the valve closed, however the gauge will not indicate any pressure. This mode is not recommended.*

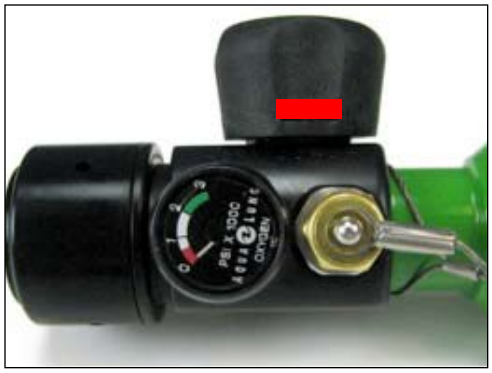


Figure 10- Valve Shut



Figure 11 - Valve Open

5. Unscrew the fill adapter cap from the fill adapter port **(Fig. 12).**

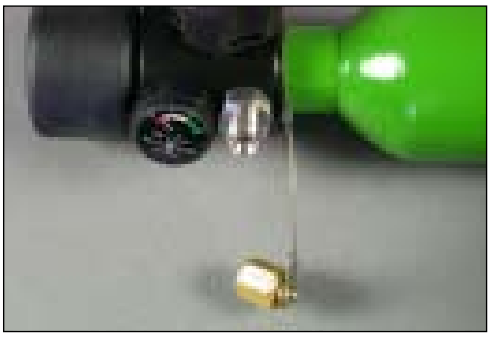


Figure 12 - Fill Port & Cap

6. Closely inspect the port opening to ensure that no debris, residue, or moisture is found to be present. Cleaning with isopropyl alcohol will help ensure the surface is clean of contaminants. Ensure the alcohol is completely evaporated prior to charging the unit.

> **WARNING -** Do not attempt to loosen or remove the first stage Q.D. connector or safety burst plug under any circumstances. Doing so could result in a dangerous malfunction of the PHODS, which could result in serious injury or death. This should only be done by a qualified technician.

> **CAUTION -** If moisture is found to be present inside the port opening, indicating that water may have entered the PHODS first-stage and cylinder, DO NOT fill or attempt to use the PHODS until it has received complete inspection and any required service by a qualified technician.

7. Attach PHODS cylinder to the charging equipment. Fill in accordance with local instructions.

> ***NOTE*** *- Always fill the cylinder as slowly as possible by turning the handwheel of the supply valve slowly to control the rate of fill. Rapid filling will generate heat and will result in an incomplete fill after the cylinder cools. If the cylinder is warm to the touch afterward, the fill rate was too rapid and cylinder needs to be topped off.*

Setting up the Mobile Oxygen Cylinder Refilling Station (MOCRS)

Refer to the MOCRS manual for specific instructions. General guidelines only are provided here.

The MOCRS consists of 2 cases with a cart and 2 separate cylinders. Open both cases and remove any packing material. Save for reuse. **(Figs. 13-16).**

Case 1

- Oxygen generator portion

Case 2

- Oxygen compressor
- Connection lines
- Connection wire
- Power cord



Figure 13



Figure 14



Figure 15



Figure 16

Refer to the MOCRS Manual for detailed instructions - Only guidelines are provided here.

1. Remove the components from case 2 and close case 2.

2. Place the 2 “K” cylinders on the cart and strap them in place.

3. Place case 2 on the cart; then place case 1 on top of case 2.

4. Connect the 2 cases together with the Umbilical cable and oxygen hose-these will be keyed so that they can not be connected incorrectly.

5. Connect the power cord to the unit but ***do not*** plug it in.

6. Remove the caps from the “K” cylinders and arrange the valve outlets facing the same direction away from the cases.

7. Connect the cylinders together using the tees and pigtails, the line to the O2 compressor and the PHODS fill line .

Plug the MOCRS into power. 110-120 VAC 60 hertz is required unless you are using the transformer. Please note that even with a transformer, 50 hertz will result in longer fill times.

You are now ready to fill the K cylinders:

☞ ***NOTE -*** *For more specific information on the MOCRS system, please refer to the user manual.*

Filling the Supply (K) Cylinders.

To turn the MOCRS on pull on the red emergency stop button; This will display the main menu on the touch screen;

Touch the “Control Screen” icon on the touch screen and the screen will display the controls;

To start the MOCRS touch the “Turn On” icon then touch the “Push To Start” icon-the unit will now start the small compressor and you will see some flashing on the touch screen-this is normal; The MOCRS is now going thru a warm up and stabilization period. During this it is testing itself and purging the nitrogen and other contaminants from the oxygen;

At this time you will want to open 1 or both of the K cylinders so the MOCRS will fill them.

☞ ***NOTE -*** *The MOCRS takes about 25-30 hours to fill a K cylinder from empty depending on the altitude.*

At this point the unit is operating automatically and no further input is needed from the operator. The following will allow you to see the unit operations:

Touch main menu, then touch gauge screen to see the air compressor pressure; low pressure oxygen pressure; high pressure oxygen pressure and the oxygen percentage. When the oxygen percentage reaches 90% the unit begins a countdown of 240 seconds (visible from the control screen) (if the oxygen purity drops it has to again reach 90% and stay there for 240 seconds); After the countdown the oxygen compressor will start and pump the oxygen to 2200 psi, either into the K cylinders or into a PHODS.

Filling the PHODS from the MOCRS K Cylinder:

The PHODS is normally filled from the K cylinders. Attach the fill hose to the fill port on the PHODS, make sure the fill valve is closed; Open 1 K cylinder and slowly open the fill valve, watching the gauge on the PHODS, slowly allow 500 psi into the PHODS then close the valve and allow the PHODS to cool for a few minutes, repeat until the PHODS is full to 2100 psi.

☞ ***NOTE*** *- Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

☞ ***NOTE*** *- The PHODS system does not include a Cylinder Fill Adapter (Fig. 17). This adapter (PN 102911) may be purchased separately.*



Figure 17

Fill a PHODS directly from the MOCRS:

Go through the start up procedures for the MOCRS and start the unit; attach a PHODS to the fill hose and wait until the MOCRS goes thru the warm up and the 240 second countdown; watch the gauge screen as the high pressure oxygen reaches 2000 psi open 1 of the K cylinders and allow the MOCRS to run into this K cylinder while you change to the next PHODS. After you have the next PHODS on the fill hose close the K cylinder and allow the MOCRS to fill the PHODS. Repeat as needed until done.

MOCRS FILL MANIFOLD & UPGRADED MANIFOLD LINE

The MOCRS Fill Manifold (PN 103048) and Upgraded Manifold Line (PN 103053) is connected to the MOCRS outlet hose, connects both MOCRS cylinders and allows charging of one to six cylinders at a time (Fig. 17a). The Manifold comes with two straps for securing the Manifold and has foam lined blast tubes for personnel safety.

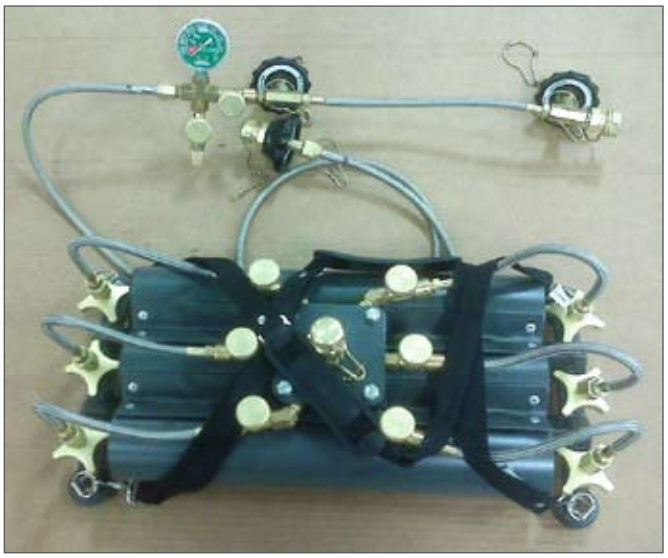


Figure 18

FILLING THE PHODS FROM AN OXYGEN CYLINDER

1. Using a calibrated pressure gauge, check the supply cylinder to ensure that it contains at least 2,700 PSI/ 186 BAR and less than 3,100 PSI/ 214 BAR. It is very important to ensure that the PHODS is filled to its total capacity, but not overfilled.

2. Remove the protector cap from the threaded nozzle of the fill adapter.

3. Attach the Cylinder Fill Adapter to the supply cylinder and tighten wrench tight.

4. Mate the threaded nozzle of the Cylinder Fill Adapter onto the open fill port, and turn clockwise by hand until snug. DO NOT apply a wrench or otherwise over-tighten the fill adapter into the first-stage.

WARNING - DO NOT attempt to fill the PHODS from a supply cylinder which is not regulated to 2,100 PSI / 145 BAR. Doing so may weaken and damage the safety burst plug assembly and/or PHODS cylinder.

5. While holding the first-stage and Cylinder Fill Adapter secure, turn the valve handwheel counterclockwise until it is completely open. When the handwheel is in the open position, the red indicator ring is not visible.

6. Support the cylinder with one hand, and slowly turn the supply cylinder valve handwheel counterclockwise to open and begin filling. As the PHODS cylinder begins to fill, make sure the pressure indicator shows that the cylinder is filling properly. Allow 500 psi into the PHODS then close the valve and allow the PHODS to cool for a few minutes, repeat until the PHODS is full to 2100 psi.

***NOTE** - Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

SYSTEM SET UP

To conserve the limited oxygen supply of the PHODS, it is required that you perform a preflight inspection of the system as follows prior to donning the Survival Vest:

WARNING - The OPC M1 LED is Night Vision Goggle (NVG) compatible and therefore difficult to see through the NVG. The LED should be viewed with the unaided eye. The OPC M1 should be mounted on the Survival Vest in a location that will allow direct viewing of the LED indicator light. The LED should be periodically checked to ensure proper operation during flight at altitudes requiring supplemental oxygen.

WARNING - Crew members are required to periodically check the amount of oxygen remaining in their PHODS cylinder.

WARNING - PHODS oxygen cylinder may burst from impact of small arms fire, resulting in overpressure shock, shrapnel injury and/or flash fire.

WARNING - The OPC M1 does not provide an indication of remaining battery life. Ensure new batteries in the PHODS during Pre-flight.

WARNING - Failure to breathe properly through the nose while using the cannula may result in oxygen deprivation.

CAUTION - When donning the flight equipment, ensure all PHODS straps and hoses are properly secured to the Survival Vest to prevent snagging during egress.

CAUTION - PHODS operation has not been verified below -25°F and performance may be degraded at lower temperatures

***NOTE** - While the regulator dial gauge indicates a full cylinder on the ground, the colder temperatures at higher altitudes will reduce the pressure in the cylinders. This is normal. At higher altitudes, Aircrew members must check the cylinder pressure in the user worn cylinders more often.*

1. To verify that your PHODS cylinder is fully charged, ensure that the gauge is reading in the “GREEN” zone, 2,100 psi. (See Fig. 19)

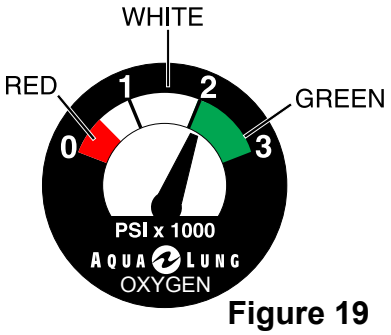


Figure 19

***NOTE** - Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

2. Open the battery cover on the back of the OPC M1, ensure the 2AA batteries are installed correctly and replace the battery cover.

***NOTE -** Batteries fit tightly, handle with care. (See Page 48)*

3. Ensure the OPC pocket is installed on the right front of the Survival Vest using the MOLLE system straps (See Figs. 23 & 24).

4. Ensure the PHODS cylinder pocket is installed on right kidney area of the Survival Vest using the MOLLE system straps.

> ***NOTE -*** *If wearing the HGU-56/P Helmet, the OPC M1 should be worn on right front chest; cylinder should be worn on right kidney. If wearing the IHADSS Helmet, the OPC M1 should be worn on the left front chest; cylinder should be worn on left kidney.*

> **WARNING -** The OPC M1 LED is Night Vision Goggle (NVG) compatible and therefore difficult to see through the NVG. The LED should be viewed with the unaided eye. The OPC M1 should be mounted on the Survival Vest in a location that will allow direct viewing of the LED indicator light. The LED should be periodically checked to ensure proper operation during flight at altitudes requiring supplemental oxygen.

5. Turn the Regulator Valve Handwheel counterclockwise to open the valve ("ON" position). Verify there is no red showing in the Valve Handwheel window. (See Figs. 20 & 21).

Figure 20

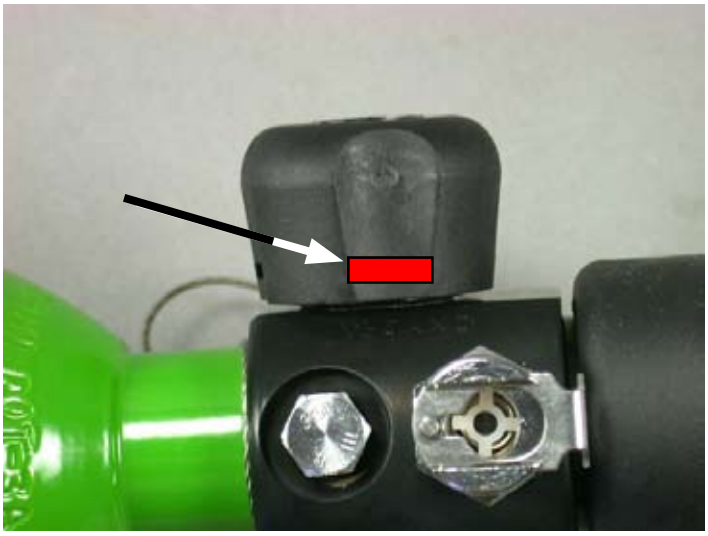
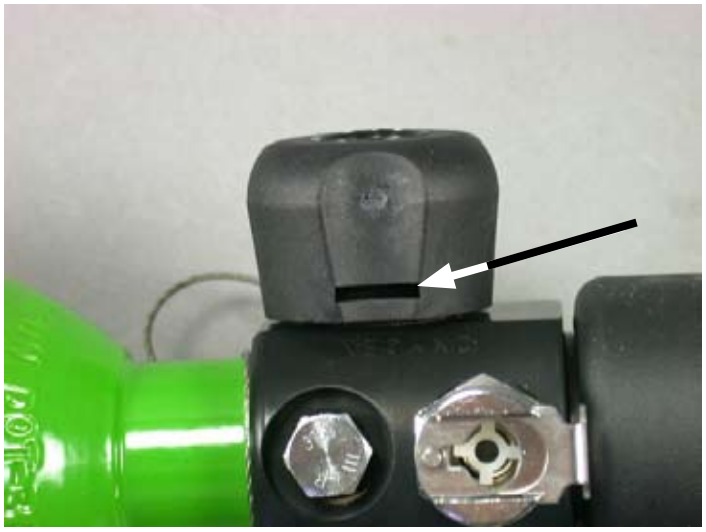


Figure 21



6. Verify your PHODS cylinder is fully charged. Gauge is reading "GREEN". (See Fig. 22)

> ***NOTE -*** *Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

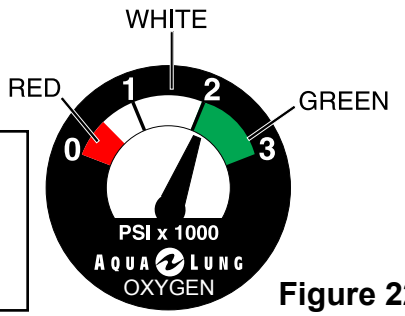


Figure 22

7. Install the PHODS cylinder in the Survival Vest Cylinder Pocket.

8. Install the OPC into the OPC pocket. Route the 30” oxygen Input Hose from the OPC over the shoulder and insert the 90 degree Q.D. connector on the regulator until it “clicks” into place. Ensure the Input Hose is secure on the shoulder. It will be routed under the MOLLE straps on the Survival Vest. (See Figs. 23 & 24)



Figure 23



Figure 24

9. Prior to inserting the oxygen output end (blue tipped) of the OPC Outlet Hose into the 6mm “Out” connector on the OPC M1, route the hose under the MOLLE straps on the Survival Vest prior to connecting to the OPC. Push the Blue Tipped Outlet Hose into the 6mm Outlet connector on the OPC until it stops. Attach the Q.D. fitting of the Outlet Hose using the MOLLE strap to the Survival Vest. Attach the input hose to the Hook and Loop fastener. (See Figs. 25 & 26)



Figure 25



Figure 26

CAUTION - DO NOT pinch the outlet hose when inserting it into the “Out” connector.

REMOVING THE TUBING

To remove the tubing, push in slightly on the tubing, then push in the connector collar (1) while you pull gently on the tubing to remove it (2). (See Fig. 27)



Figure 27

CAUTION - DO NOT pull on the tubing without pushing in the collar; it will damage the connector.

NASAL CANNULA MOUNTING

If the Nasal Cannula is not mounted in the helmet, it must be mounted prior to use of the Helmet. Use the instructions provided on page 51 to mount the Cannula Clip on the inside of the lower right lobe of the helmet.

1. Shown is the Nasal Cannula Mounting Clip for the HGU-56/P Helmet installed on the inside right dome of the helmet. (See Fig. 28)



Figure 28

2. This is the Mounting Clip and the Nasal Cannula interface. To mount the Nasal Cannula, align the interface of the Nasal Cannula and the Clip with the nose piece to the front, and press tightly until it snaps into place. (See Fig. 29)



Figure 29

3. After mounting the Nasal Cannula, ensure the 90° fitting is pointing down and out of the rear of the helmet. (See Fig. 30)

4. The Nasal Cannula must be removed to use the optional PHODS Mask. To remove the Nasal Cannula, grasp the Nasal Cannula firmly on one side of the clip and pull down firmly.



Figure 30

5. Prior to donning the Flight Helmet, connect the open end of the coiled hose to the Nasal Cannula in the Helmet (or optional PHODS Mask) if not already done. Push the hose into the Cannula fitting until it stops. Use only the supplied PHODS Cannula as other cannula may not work properly with the OPC (See Fig. 31).



Figure 31

6. After the Flight Helmet is donned, connect the coiled hose Q.D. to the OPC outlet hose Q.D. attached to the Survival Vest. Push in until the Q.D. connector “clicks” into place (See Fig. 32).



Figure 32

7. The unit is installed and ready for operation.



Figure 33

8. OPC M1, Nasal Cannula, Regulator connection, Regulator and Cylinder. (See Figs. 33 & 34).



Figure 34

IHADSS CANNUAL MOUNTING

To install the IHADSS Clip, loosen the helmet microphone knurled knob on the left side of the helmet. Slip the IHADSS clip over the post behind the knob. Retighten knob and adjust the clip/cannula as needed (See Figs. 35-38).



Figure 35



Figure 36



Figure 37



Figure 38

CONTROL SWITCH SETTINGS AND MODES OF OPERATION

The OPC M1 unit is controlled by two push button control switches. Specific settings are shown in (Figs. 39-43). For assistance in selecting the proper operational Mode, refer to Figure 44.

Control Switch Settings

The OPC M1 has three main modes of user controlled operation:

1. (OFF) - OPC M1 non-operational and powered down.
2. (ON) Fully-Automatic pre-set delivery beginning between 8,000 ± 500 ft. PA to 10,000 ft. PA Nasal Cannula only.
3. (R/M) Reserve/Manual - Maximum flow pulse upon inhalation at any altitude. Do not use this setting above 16,000 ft.
4. (F20) Automatic at all altitudes - Face mask or Nasal Cannula. This is the suggested setting for high workload environments. See Figure 43 for specific altitude restrictions.
5. Before proceeding, review the information on the front panel of the unit, which provides an easy reference to various operational modes (See Fig. 39).

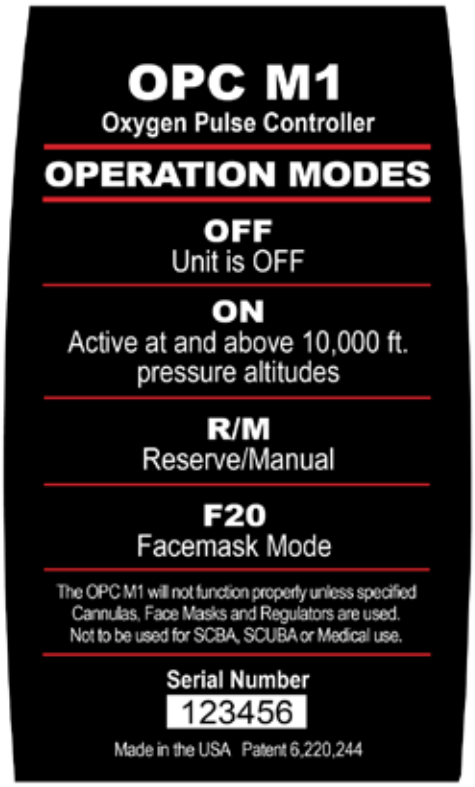


Figure 39

MODE SELECTION

To turn the OPC on from the **OFF** position, press the "**I**" button once. The display will change to "**ON**" mode. This will power up the unit and make it operational for normal use. Press the "**I**" button once more and the unit will change to "**R/M**" mode. Press the "**I**" button again and the unit will change to "**F20**" mode. To return the to a previous mode, press the "**+**" button. Continue to press the "**+**" to return the unit to the "**OFF**" position (See Figs. 39-43).

OFF Mode

To return to the OFF Mode from any operational mode, push the "**+**" button repeatedly until "OFF" is displayed (See Fig. 40).

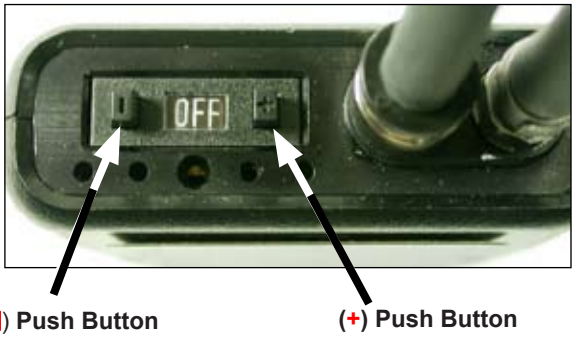


Figure 40

Switch set in the "OFF" setting

ON MODE

In this setting the OPC M1 will immediately start the standard oxygen flow providing pulses of oxygen appropriate for an individual using a cannula when the unit is between 8,000 ± 500 ft. PA to 10,000 ft. PA . It will continue to pulse oxygen until the unit returns below 8,500 ft. In this mode, the OPC M1 may not provide a pulse with every inhalation based on your inhalation rate; this is part of normal operation. The OPC M1 at power up will allow up to 20 BPM. As the user breathes faster, the unit will compensate and allow up to 45 BPM (See Fig. 41).

- **Flow start: between 8,000 ± 500 ft. PA to 10,000 ft. PA**
- **Use with: Cannula**
- **Altitude Compensating: Yes**



Figure 41

NOTE *- The OPC ON mode is designed to provide the amount of oxygen needed by an average size healthy person using a cannula at the given altitudes; your needs may be different.*

R/M: "RESERVE/MANUAL"

R/M, for "Reserve" or "Manual" mode, provides the **maximum** oxygen flow regardless of altitude. In this mode, the OPC M1 may not provide a pulse with every inhalation based on your inhalation rate; this is part of normal operation. The R/M Mode will not be used above 16,000 ft (See Fig. 42).

- **Flow start: All altitudes**
- **Use with: Cannula or face mask**
- **Maximum Altitude of 16,000 ft.**
- **Altitude compensating: No**
- **Reduced system duration when used**



Figure 42

F20 MODE "PHODS MASK"

The F20 mode is called the "PHODS mask" setting. It supplements the standard oxygen flow by adding to the OPC M1's perceived altitude. The F20 mode is designed to be used with the PHODS Mask, the consequence of the F20 mode is a higher consumption of oxygen (See Fig. 43).

- **Flow starts: All altitudes**
- **Use with: PHODS mask**
- **Altitude compensating: Yes**



Figure 43

OXYGEN DELIVERY MATRIX

This Matrix is provided to assist aircrew members in selecting a delivery method for the projected operational consumption of oxygen (See Fig. 44).

DELIVERY MODE MATRIX

		PILOTS/LOW WORK LOAD				CE/FE/HEAVY WORKLOAD			
	Delivery Method	Nasal Cannula	Nasal Cannula	Mask	Mask* #	Nasal Cannula	Nasal Cannula	Mask	Mask* #
	OPC Mode	ON	F20	F20	R/M	ON	F20	F20	R/M
Flight Altitude	8K								
	10K								
	12K								
	14K								
	16K				**	**			
	18K				**	**	**		**

Preferred Mode and Delivery Method

* R/M may be used below 10k for heavy smokers or while flying at night for increased night vision

R/M mode increases consumption at all Altitudes

Duration Color Code	
	Normal Duration
	Short duration only
**	Do not use

Figure 44

WARNING - The OPC M1 LED is Night Vision Goggle (NVG) compatible and therefore difficult to see through the NVG. The LED should be viewed with the unaided eye. The OPC M1 should be mounted on the Survival Vest in a location that will allow direct viewing of the LED indicator light. The LED should be periodically checked to ensure proper operation during flight at altitudes requiring supplemental oxygen.

OTHER OPC FUNCTIONS

DISPLAY AND ALARM INFORMATION

There is a green LED display on the OPC M1. A lighted Green LED indicates oxygen flow for every breath during inhalation. A flashing Green LED indicates a flow fault, apnea condition or low battery. To determine what the LED is indicating, refer to the guide that is provided on the back of the OPC unit. The following alarm information is provided (See Fig. 45).

FLOW FAULT ALARM

Coinciding with your inhalation, the OPC M1 will produce a two second flashing Green LED to indicate that the oxygen flow from the cylinder has stopped. This typically means that:

1. The oxygen supply is depleted.
2. The supply line has been pinched closed.
3. The supply line is plugged up or disconnected.
4. The valve has failed to open.

APNEA ALARM

After 30 seconds of undetected breathing, the OPC M1 will produce a visible Green LED (4 flashes) Apnea alarm every four seconds until breathing resumes. This typically occurs for the following reasons:

1. The user has quit breathing for 30 seconds.
2. The cannula/face mask is improperly worn.
3. The outlet tube from the OPC M1 to the mask or cannula has become disconnected.
4. The outlet tubing has become pinched or is plugged off.

LOW BATTERY (Normal Operations-no audible)

The OPC M1 will operate for approximately 100 hours with a fresh set of alkaline batteries under normal operation. **The OPC M1 provides 3 levels of low battery warning:**

1. **First warning** will occur when the battery level reaches approximately 4-8 hours remaining and will appear as a single flash of the Green LED every 2 seconds. The unit will continue to operate properly for about 4-8 hours at 70°F (25°C) after the indicator starts to flash. **Replace batteries as soon as practical.**
2. **Second warning** occurs approximately 1-2 hours remaining. The Green LED will double flash every 2 seconds. **Batteries must be replaced as soon as possible.**
3. Within the last approximate 1 hour of battery life remaining, the oxygen flow will stop and **batteries must be replaced IMMEDIATELY.**



Figure 45

ALARM INFORMATION

When setting the unit to ON mode, the user should wear the cannula. Otherwise, even when below the 10,000 feet threshold, the Apnea alarm is "**ON**" **and will detect that no one is breathing, causing the alarm to activate the Apnea alarm with the flashing Green LED. The unit is calibrated for up to 45 BPM (Breaths per Minute) in all active switch positions.**

> ***NOTE*** *-The OPC M1 unit is programmed to start operation once it senses a pressure altitude of 8,000 ± 500 ft. PA. Due to the differences in barometric pressures and other factors where the unit may be operating, the OPC M1 is guaranteed to start operation at and over 10,000 ft.PA.*

BATTERY CHECK (Initial Start-up)

The OPC M1 provides a battery and system check when the unit is first turned on.

Normal Operations: If the batteries and system are ok, the Green LED will flash multiple times and the audible alarm will sound and cease. This is the only time the audible alarm should be heard.

If during the start-up check, the unit senses the batteries have less than four (4) hours duration remaining, the audible alarm will continue, the LED will continue to flash rapidly and the solenoid valve will continue to pulse. Severely depleted batteries will only flash the LED.

Portable Helicopter Oxygen Delivery System MISSION KIT
PN 102936



Figure 46

The Mission Kit provides up to 5 fully charged PHODS regulators & cylinders for aircrew cylinder change out during flight operations (See Fig. 46).

> ***NOTE -*** *Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

> ***NOTE -*** *While the regulator dial gauge indicates a full cylinder on the ground, the colder temperatures at higher altitudes will reduce the pressure in the cylinders. This is normal. At higher altitudes, Aircrew members must check the cylinder pressure in the user worn cylinders more often.*

REGULATOR AND CYLINDER CHANGE OUT

1. To change out an empty or non-operational Regulator and Cylinder.
2. Shut the cylinder valve off & turn off the OPC.
3. Disconnect the Q.D. connector on the Regulator by depressing the lever until the 90° Q.D. connector releases.
4. Unsnap the cylinder retaining straps and remove the Regulator and Cylinder from the Pocket.
5. Obtain a full cylinder from the Qualified Technician or from the Mission kit while in flight.
6. Turn on the new cylinder and verify that it is full with the gauge in the green. Turn off the cylinder valve.
7. Install the new cylinder in the pocket and attach the straps if possible.
8. Push the 90° Q.D. connector into the Q.D. connector on the regulator.
9. Turn on the cylinder valve & set the OPC to the applicable mode.
10. Check the OPC for flow and proper operation.

OPTIONAL PHODS MASK

The Oxygen mask design includes the mounting brackets necessary to connect the mask to the HGU-56/P helmet, with or without the Maxillofacial Shield (MFS) installed. It may be used with the optional snap adapters to connect the mask to the HGU-84/P helmet without the MFS installed. This provides versatility to air crew members allowing them to customize the system according to mission demands. The system remains stable throughout the flight performance envelope of helicopters, is easy to don, and has quick disconnect features. The mask assembly's quick release snaps and adjustable fasteners allow three unique configurations wherein the MFS and oxygen mask can be used independently or together for maximum protection.

The mask includes an integrated M-169A/AIC dynamic 5-ohm microphone to aid communications.

Use of a mask will supply an adequate oxygen mixture to users who are under mental or physical stress and who, as a result, will breathe through their mouths instead of their noses. Oxygen enters from the OPC Regulator hose and travels through a 90 degree oxygen elbow next to the inlet port of the Mask to allow the oxygen to enter the mask cavity. Exhaled gasses exit the mask through the exhalation valve (See Figs. 47 & 48). Ports can be reversed to accomodate right or left side installation of the PHODS inlet hose.See Appendix A for specific information on the PHODS Mask.

☞ ***NOTE*** - *The standard Maxillofacial Shield may be converted for use with the PHODS mask system by following the instructions on page 52 of this manual*

WARNING - Oxygen should be delivered to the inlet port on the side of the mask with the inhalation valve to ensure proper dilution of the oxygen with the ambient air in the mask cavity.

WARNING - Disinfect the PHODS Mask or Nasal Cannula & Nose Piece after each use to avoid bacteriological contamination and for cleanliness. Cleaning can be accomplished with isopropyl alcohol.



Figure 47



Figure 48

MANUFACTURERS RECOMMENDED PHODS PRE-FLIGHT CHECKLIST

Check

1. Verify all PHODS components are present.
2. Verify PHODS Valve is open and the regulator gauge is in the green.

> ***NOTE*** *- Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

3. Install 2 new AA batteries in the OPC. Ensure the battery compartment door is secure.
4. Push the " I " button on the OPC once to the ON Mode. The OPC Green LED will produce a series of flashes and the audible alarm will sound. If LED continues to flash after the initial series refer to Troubleshooting pg 54.
5. Verify PHODS cylinder pocket is secured to the Survival Vest properly.
6. Verify OPC M1 pocket is secured to the Survival Vest properly.
7. Install the PHODS Cylinder and Regulator into the Cylinder pocket and secure with the fasteners.
8. Install the OPC M1 into the OPC pocket. Ensure the hook and loop closure is securely fastened.
9. Route the 30" OPC Hose through MOLLE straps, over the shoulder and connect the 90° connector into the Q.D. connector on the Regulator. Ensure the Q.D. connector clicks into place.
10. Route the OPC Outlet hose through the MOLLE straps from the upper chest to the OPC Pocket.
11. Verify the MOLLE attachment on the Q.D. Fitting is attached to the Survival Vest and the Blue Tip of the hose has sufficient length to be pushed into the OPC.
12. Push the OPC Outlet hose into the 6mm connector on the OPC.
13. Select Helmet mounted delivery method.

Check

Helmet - Nasal Cannula

1. Ensure the Nasal Cannula is mounted in the helmet securely and it has the 90° connector at the rear, facing outward.
2. Ensure the Nasal Cannula has a removable Nose Piece installed.
3. Push the open end of the Coiled Hose into the 90° fitting until it stops.
4. Don the Helmet and push the Q.D. fitting on the Coiled hose into the Q.D. fitting attached to the Survival Vest.
5. Position the Nasal Cannula into the nose and inhale while observing the OPC in the R/M position. The Green LED should flash once indicating a properly functioning unit.
6. To Simulate the Flow fault alarm. Disconnect the Q.D. 90° connector from the regulator and inhale. The Green LED should produce a constant flashing for 2 seconds. This indicates a flow fault. Reconnect Q.D 90° connector.
7. The system is verified functional.
8. Remove the Nasal Cannula from the nose, disconnect the Coiled Hose Q.D. by pushing the Vest Fitting Q.D. lever in, remove the helmet, Change the mode on the OPC by pushing the "+ " button once to the ON Mode. The unit is ready for use. When not breathing on the device the LED with will flash 4 times indicating no breaths have been taken in 30 seconds.

Check

Helmet - PHODS Mask

1. Ensure the Nasal Cannula is removed from the helmet.
2. Ensure there is a red plug in the other unused 90° fitting on the exhalation side of the mask.
3. Push the open end of the Coiled Hose into the 90° fitting on the inhalation side of the mask until it stops.
4. Push the Q.D. fitting on the Coiled hose into the Q.D. fitting attached to the Survival Vest.
5. Don the Helmet and attach the PHODS Mask to the helmet. Ensure correct fit.
6. Inhale while observing the OPC in the F20 position. The Green LED should flash once indicating a properly functioning unit.
7. The system is verified functional.
8. Remove the Mask from one side of the helmet, disconnect the Coiled Hose Q.D. by pushing the Vest Fitting Q.D. lever in, remove the helmet; the unit is ready for use. When not breathing on the device the LED with will flash 4 times indicating no breaths have been taken in 30 seconds.

MANUFACTURERS RECOMMENDED PHODS POST-FLIGHT CHECKLIST

Check

1. Turn off the OPC by pressing the “ + “ button to the OFF Mode.
2. Shut the Cylinder valve off.
3. Disconnect the Coiled hose from the Vest Q.D. connector by pushing the lever in until the Hose Q.D. releases.
4. Remove the Coiled Hose from the PHODS Mask or Nasal Cannula by pushing the Black ring on the fitting and pulling the Hose out.
5. Remove the OPC Outlet Hose from the OPC by pushing the Black ring on the fitting and pulling the Hose out.
6. Disconnect the MOLLE Strap from the Survival Vest and remove the OPC Outlet hose.
7. Disconnect the OPC Inlet hose from the Regulator pushing the lever in until the Hose Q.D. releases.
8. Remove the OPC from the pocket after unthreading the OPC inlet hose from the Survival Vest.
9. Unsnap the retaining straps and remove the Regulator and Cylinder from the pocket.
10. Disinfect the Mask or Nasal Cannula & Nose Piece with Isopropyl Alcohol wipe. Let Air Dry.
11. Remove batteries from OPC and return all components to the proper position in the PHODS case.
12. Report any discrepancies to the Qualified Technician upon return.

PHODS Checklist Insert

DISPLAY AND ALARM INFORMATION
Normal Operation
- Green LED single flash per breath during inhalation
- When you set the unit to ON mode, you must wear your cannula or face mask. Even though you are below the 10,000 feet threshold, the Apnea alarm is "**ON" and will detect that no one is breathing, causing the alarm to activate with the flashing Green LED. The unit is calibrated for up to 45 BPM (Breaths per Minute) in all active switch positions.**

FLOW FAULT ALARM
Coinciding with your inhalation, the OPC M1 will produce a two second flashing Green LED to indicate that the oxygen flow from the regulator has stopped.

APNEA ALARM
Green LED (4 flashes) every four seconds to indicate that breathing has not been detected within the past 30 seconds and will continue to flash until breathing is resumed.

LOW BATTERY
The OPC M1 provides 3 levels of low battery warning:
(1) The first warning Green LED will single flash every 2 seconds.
(2) The second warning Green LED will double flash every 2 seconds.
(3) Within the last approximate 1 hour of battery life, the oxygen flow will stop

BATTERY CHECK
When OPC M1 is turned on- Green LED will flash rapidly and an audible alarm will sound and cease - verifies the batteries and circuits are working. If the Batteries are low; LED will continue to flash, Alarm will continue to sound & Solenoid valve will continue to cycle- Replace Batteries. Severely depleted batteries will only flash the LED.

Figure 49

Pilot's or crew's knee board (See Fig. 49)**.**
Copy and cutout for use

PHODS MAINTENANCE PROCEDURES

Introduction

This section of the manual provides factory prescribed procedures for the correct service and repair of the Aqua Lung PHODS System. It is not intended to be used as an instructional manual for untrained personnel. The procedures outlined within this manual are to be performed only by personnel who have received Factory Authorized training through an Aqua Lung Service & Repair Seminar. If you do not completely understand all of the procedures outlined in this manual, contact Aqua Lung to speak directly with a Technical Advisor before proceeding any further. PHODS has black external parts, however, white and chrome parts are used in this manual for clarity.

NOTE - *Safety Plug is a chrome colored part.*

Scheduled Service

PHODS should be given the same care and maintenance as any life support equipment. It is therefore important to perform scheduled overhaul service for the complete unit, according to the procedures outlined in this manual on a regularly scheduled basis. Visual inspection and factory prescribed service must be performed at least **once every 12-18 months** by a factory trained technician.

General Guidelines

1. In order to correctly perform the procedures outlined in this manual, it is important to follow each step exactly in the order given. Read over the entire manual to become familiar with all procedures before attempting to disassemble the product in this manual, and to learn which specialty tools and replacement parts will be required. Keep the manual open beside you for reference while performing each procedure. Do not rely on memory.

2. This is an Oxygen Delivery System. Cleanliness MUST be maintained at all times. Powder free latex gloves should be used for all internal assemblies. All service and repair should be carried out in a work area specifically set up and equipped for the task. Adequate lighting, cleanliness, and easy access to all required tools are essential for an efficient repair facility. Ref.: U.S. Navy Preventative Maintenance System/Maintenance Requirement Card (MRC H-12/R-1). See Procedure A for Oxygen Clean Area Guide.

NOTE - *Review Procedure A: Cleaning and Lubricating Prior to Disassembly and Assembly.*

3. Before beginning any disassembly, it is important to first perform the Initial Inspection procedure, and refer to Table 1 Troubleshooting p.50 to determine the possible cause of any symptoms which may be present.

4. As each unit is disassembled, reusable components should be segregated and not allowed to intermix with nonreusable parts or parts from other units. Delicate parts, including inlet fittings and crowns which contain critical sealing surfaces, must be protected and isolated from other parts to prevent damage during the cleaning procedure.

5. Use only genuine Aqua Lung ® parts provided in the overhaul parts kit for this product. DO NOT attempt to substitute an Aqua Lung ® part with another manufacturer's, regardless of any similarity in shape or size.

6. Do not attempt to reuse mandatory replacement parts under any circumstances, regardless of the amount of use the product has received since it was manufactured or last serviced.

7. When reassembling, it is important to follow every torque specification prescribed in this manual, using a calibrated torque wrench. Most parts are made of either marine brass or plastic, and can be permanently damaged by excessive stress.

8. Only use Christo-lube MCG-111, this lubricant is compatible with oxygen systems. Apply only a light film of Christo-lube MCG-111 to o-rings, avoid excessive amounts of lube, except where directed.

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General Conventions

Unless otherwise instructed, the following terminology and techniques are assumed:

1. When instructed to remove, unscrew, or loosen a threaded part, turn the part counterclockwise.

2. When instructed to install, screw in, or tighten a threaded part, turn the part clockwise.

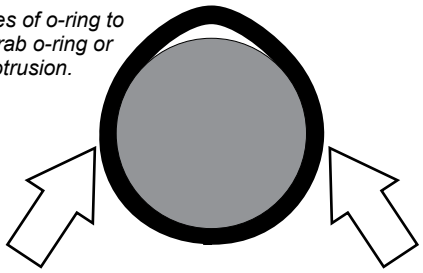
3. When instructed to *remove* an o-ring, use the pinch method (see illustration below) if possible, or use a brass or plastic o-ring removal tool. Avoid using hardened steel picks (unless directed), as they may damage the o-ring sealing surface. All o-rings that are removed are discarded and replaced with brand new o-rings.

4. The following acronyms are used throughout the manual: **LP** is Low Pressure; **IP** is Intermediate Pressure; and **HP** is High Pressure.

5. Numbers in parentheses reference the key numbers on the exploded parts schematic on page 59. **For example**, in the statement, "...remove the o-ring (3) from the...", number 3 is the key number to the piston head o-ring.

Pinch Method

Press upwards on sides of o-ring to create a protrusion. Grab o-ring or insert o-ring tool at protrusion.



Initial Inspection Procedure
External Inspection

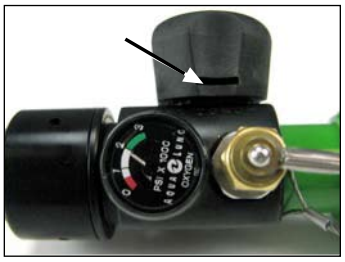
1. Remove the covers from the Oxygen Bottle / OPC M1 and set aside.



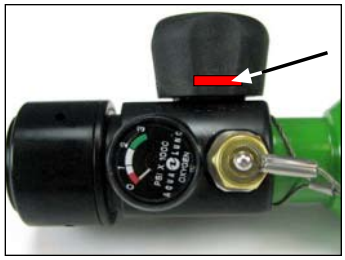
2. Inspect the fill port (29) for any signs that contaminants, such as moisture or particulate matter, may have entered the system.

3. Visually inspect hoses (33, 35, 36) along their length for any signs of deterioration or damage, such as blistering, abrasion, or corrosion of the fittings.

4. Slowly pressurize the system by turning the on-off hand-wheel (21) counterclockwise.

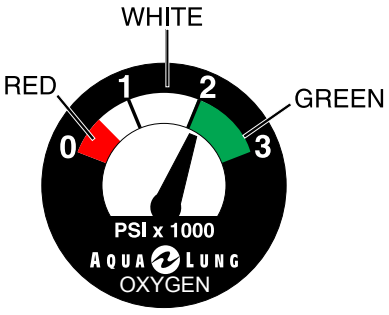


ON



OFF

5. Examine the dial gauge (30) to determine the gauge is in the green, indicating that the PHODS cylinder is full.



NOTE - *Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

6. Use your fingers remove the cap protector (1) from the cap (2). Twisting the cap protector may help during removal.



Immersion / Leak Test

1. Disconnect the OPC M1 supply hose from the Q.D. connector.

2. Ensure the cylinder is full and the cylinder valve is open all the way by turning the regulator valve handwheel (21) until there is no red showing in the valve handwheel window.

3. Listen for any audible leaks coming from the PHODS regulator.

4. Submerge PHODS cylinder and regulator in fresh water to visually inspect for leakage. If air bubbles are detected, refer to the Troubleshooting Table on p.50 as needed.



Intermediate Pressure Test

1. Ensure the regulator valve handwheel (21) is open.
2. Connect Intermediate Pressure (IP) gauge (PN 102969).
3. Pressurize system making sure to check that the dial gauge (30) is reading full (gauge needle in green).
4. IP should be 25 ± 10 psig (1.7 ± .69 bar). Cycle the bleed valve several times, to ensure IP “lockup”.





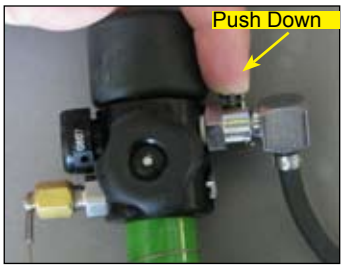
NOTE- *IP lock up is defined as: No further increase of IP after the unit is pressurized and stable.*

NOTE - *Before performing any disassembly, refer to the exploded parts drawing, which references all mandatory replacement parts. These parts should be replaced and must not be reused under any circumstances – regardless of the age of the regulator or how much use it has received since it was last serviced.*

CAUTION - Use only a plastic or brass o-ring removal tool (p/n 944022) when removing o-rings to prevent damage to the sealing surface. Even a small scratch across an o-ring sealing surface could result in leakage. Once an o-ring sealing surface has been damaged, the part must be replaced. DO NOT use a dental pick or any other steel instrument, except where instructed.

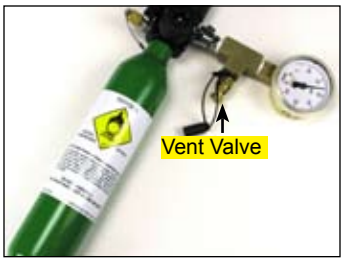
PHODS Regulator Disassembly

1. If not already done, disconnect the OPC (Q.D.) hose (36) from the Q.D. connector (9) by depressing the lever and lightly pulling the Q.D. connector hose out. Set the OPC aside.





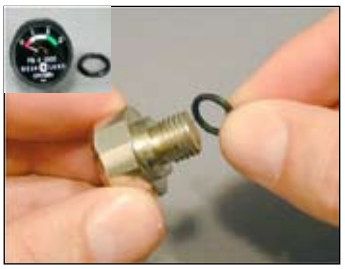
2. Install the IP gauge into the Q.D. connector (9). Turn the unit on and use the vent valve on the IP. gauge to depressurize the cylinder to zero (0) psi SLOWLY prior to maintenance. Shut the ON/OFF valve once zero psi is reached.





3. Remove the dial gauge (30) using a 7/8” crowfoot wrench (PN 9-43628) and flex wrench (PN 103045). Turn counterclockwise. Remove and discard the pressure gauge o-ring (28).





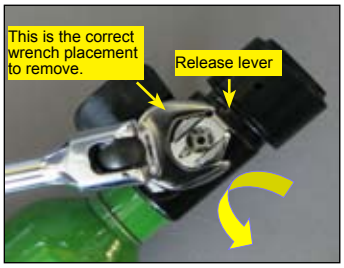
CAUTION - Avoid damaging the fill port adapter (29) with the wrench.

NOTE - *Chrome dial gauge used for clarity.*

4. With the gauge removed, slowly open the ON/OFF valve and bleed any remaining pressure from the bottle. Leave the valve open. This is required due to the design of the regulator to prevent moisture from entering the system.



5. The Q.D. connector (9) is not normally removed unless leakage is discovered. If required, remove the Q.D. connector using a 5/8” crowfoot wrench (PN 103009). Remove any residual teflon tape remaining on the Q.D. connector. Inspect the body and remove any teflon tape residue.





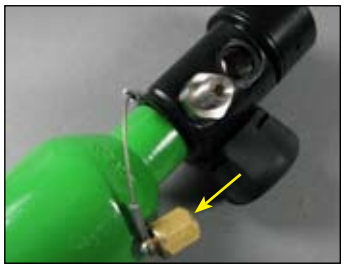
CAUTION - The release lever button on the Q.D. connector can be damaged if the wrench placement is not correct.

6. Remove the safety plug (10) from the first stage body (8) using a 3/8” socket (PN 9-43001) and flex wrench (PN 103045). Discard the safety plug. DO NOT REUSE.



NOTE - *Q.D. connector was removed for clarity.*

7. Unscrew the fill port cap from the fill port. Using a 9/16" socket (PN 103006) and flex wrench (PN 103045) remove the fill port (29) and discard the o-ring (28).





8. Unscrew the handwheel retaining nut (24) using a notched medium flat blade screwdriver (PN 941586).




9. Remove the handwheel washer (23), handwheel spring (22), handwheel (21), indicator ring (19), and washer (20) from the valve stem (12). All of these parts will be re-used during assembly.



10. Using a 3/4" socket (PN 103007) and flex wrench (PN103045), unscrew the bonnet (18) from the first stage body (8). Pull the valve stem (12) out of the bonnet (18).




CAUTION: Some components in the bonnet assembly may remain in the bonnet or come out of the bonnet when removed from the body.

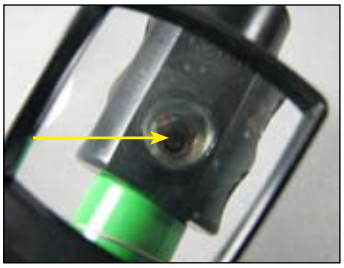
11. Remove the backup ring (16), o-ring (15), washer, brass (14) and washer, teflon (13) from the stem. Discard all items except the washer, brass (14) once removed from the valve stem. Remove and discard the o-ring (17) from the bonnet (18).



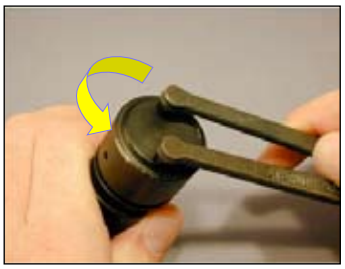

12. Insert the squared end of the valve stem (12) into the seat disc assembly (11) and unscrew the seat disc assembly (11) from the first stage body (8). Discard the seat disc assembly - DO NOT REUSE.



13. Using a magnifier (PN 9-BA819008), inspect the condition of the crown. There should be no scratches, nicks or dents on the crown sealing surface.



14. Insert the pins of the adjustable spanner wrench (PN 107394) into the two corresponding holes in the top of the piston cap (2). Unscrew the piston cap from the first stage body (8).



CAUTION - Ensure that the pins are seated and secure. External damage to cap may result if pins slip out. This will not affect regulator operation.

15. Remove the spring (7) from the first stage body (8).

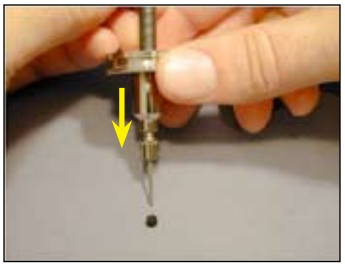


16. Separate the piston (4) from the cap (2). Inspect the inside surface of the cap for corrosion or scratches.



17. Remove and discard the two o-rings (3 & 5) from the piston (4). Insert the pin of the seat extraction tool (PN 109437) down the bore of the piston (4) and press out the HP seat (6). Discard the HP seat.





18. Hold the cylinder (26) secure, using the bottle vise adapter (PN 100398). Unscrew the first stage body (8) from the cylinder using a 1 3/16” crowfoot (PN FC38A) & flex wrench (PN 103045)



CAUTION - Position the crowfoot wrench at the top of the regulator body to prevent damage to the regulator ports.

19. Remove the fill port cap retaining wire from the cylinder (26). Remove and discard the o-ring (27) from the first stage body (8) cylinder threads.





20. Perform a visual inspection of the cylinder (26) according to Compressed Gas Association (CGA) standards. These standards are found in CGA pamphlet CGA C-6.- 2007, “STANDARDS FOR VISUAL INSPECTION OF STEEL COMPRESSED GAS CYLINDERS”. Do not reuse a damaged or corroded cylinder. Either replace the cylinder with a new one or have the cylinder cleaned/serviced by an authorized repair facility.



NOTE - *Visually inspect cylinder for corrosion, moisture, rust and cracks in the lower neck area.*

This Concludes PHODS Regulator Disassembly

Before beginning reassembly, perform parts cleaning and lubrication in accordance with ***Procedure A: Cleaning and Lubricating (p.56).***

NOTE - *A reminder that powder free Latex or Nitrile gloves should be used for all internal assemblies.*

PHODS Regulator Assembly

1. Install the fill port cap retaining wire over the cylinder (26) neck.



2. Install a new, lightly lubricated o-ring (27) over the first stage cylinder threads so that it is seated against the first stage body (8). Place 3 small dabs of Christo-Lube around the diameter of the first stage body (8) threads. This will ensure that the first 4 to 5 threads are lubricated.



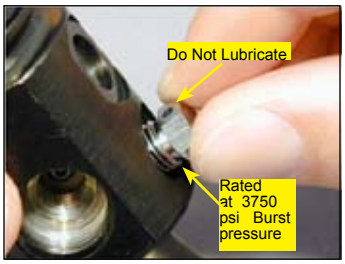


3. Thread the first stage body (8) into the cylinder (26) until hand tight. Attach a 1-3/16"crowfoot (PN FC38A) to a torque wrench. While holding the cylinder firmly in the bottle vise adapter (PN 100398), tighten the first stage body to a torque value of **25 ± 3 foot-pounds (33.9 ± 2.7 Nm)**.



CAUTION - Position the crowfoot wrench at the top of the regulator body to prevent damage to the regulator ports.

4. Thread a new 2250 psi (working pressure) safety plug (10) into the lower port on the first stage body (8) (the side opposite of the fill port). Attach a 3/8" socket (PN 9-43001) to a torque wrench and tighten the safety plug to **90 ± 5 inch-pounds (10.2 ± .6 Nm)**. Do not exceed 110 inch-pounds (12.5 Nm).





CAUTION- Do not lubricate the threads of the safety plug.

5. Lubricate and install a new piston shaft o-ring (5) and piston head o-ring (3) onto the piston (4). Apply additional Christo-Lube to the small o-ring prior to installation into the body.



6. Closely examine the new HP seat (6). One edge is sharp and one edge has a chamfer. With the chamfered edge facing outward, press the HP seat into the small, recessed hole in the end of the piston (4). This may be accomplished by putting the chamfered edge down on a hard, clean surface and pushing the piston over it.

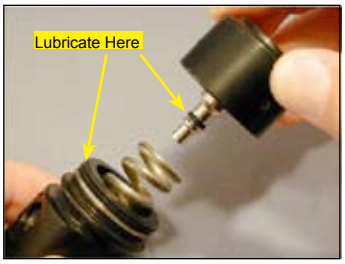


7. Place the spring (7) into the first stage body (8). Press the piston (4) into the cap (2) so that the piston head is seated flat against the cap.

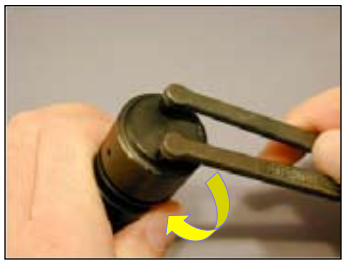




8. Lubricate the male threads on the body (8) and small o-ring (5), then pass the piston shaft through the spring (7).



9. While pressing down on the piston cap (2), tighten the cap by turning clockwise with the adjustable spanner wrench (PN 107394) until the cap (2) stops against the first stage body (8).



CAUTION - Ensure that the pins are seated and secure. External damage to cap may result if pins slip out. This will not affect regulator operation.

10. Place a new, lightly lubricated washer (13) onto the valve stem (12). Place the washer, brass (14) against the washer (13).

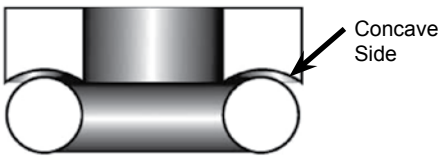




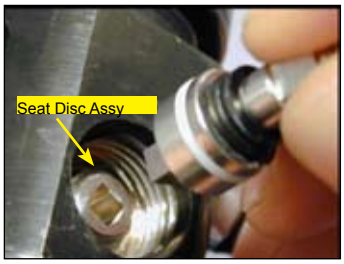
11. Place a new lubricated o-ring (15) against the washer, brass (14). Examine the backup ring (16) to determine which side is flat and which side is concave. Lubricate and install the backup ring (16) with its concave side against the o-ring (16).







12. Lubricate the threads of the new seat disc assy (11). Using the squared end of the valve stem (12), screw the seat disc assy (11) into the first stage body (8) until finger tight. Leave the valve stem (12) in the seat disc assy (11).

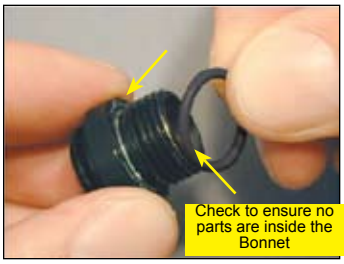


13. Using the handwheel (21) as a wrench, place the handwheel over the valve stem (12) and tighten the disc seat assy (11) hand tight. Remove the handwheel. Leave the valve stem in place.



CAUTION - Failure to tighten the seat will cause damage to the bonnet when installed and torqued.

14. Install a new, lubricated o-ring (17) onto the bonnet (18) so that the o-ring fits into the groove located above the larger threads. Check the inside of the bonnet to ensure the old backup ring (16) and o-ring (15) were removed.



15. Lubricate the threads of the bonnet (18), then pass the bonnet (18) over the valve stem (12). Thread the bonnet (18) into the body (8).



16. Attach a 3/4" medium deep-well socket (PN 103007) to an inch pounds torque wrench and tighten the bonnet (18) to **120 ± 3 inch-pounds (13.6 ± .3 Nm)**. Do not exceed 125 inch pounds (14.1 Nm).



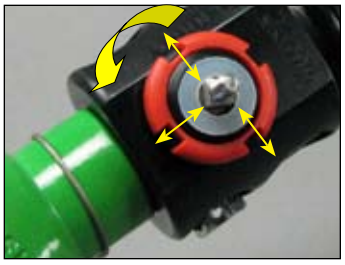
17. Place the large nylon washer (20) over the valve stem (12), against the bonnet (18).



18. With the rounded edge of the indicator ring (19) facing outward, lightly thread the indicator ring onto the bonnet until it stops. Do not tighten.



19. When the indicator ring (19) stops, turn it counterclockwise so the corners of the square shaft of the stem (12) point to the centers of the square notches. Then turn an additional 90 degrees. This is critical to align the handwheel (21) with the valve stem (12) during installation and allow full range of motion for the valve after assembly.



20. Place the handwheel (21) over the indicator ring (19) by aligning the notches in the red indicator ring with the bars in the backside of the handwheel. Insert the spring (22) into the valve handwheel (21), followed by the small handwheel washer (23) over the top of the spring (22).







21. Hand start the handwheel retaining nut (24). Using a modified medium flat-bladed screwdriver (PN 941586), screw the handwheel retaining nut (24) onto the end of the stem (12) until the retaining nut will not turn any further.





CAUTION- Do not cross thread. Any resistance felt means it is cross threaded. In this case, remove the retaining nut and start again.

22. Place a new lubricated o-ring (28) on the fill port (29). Ensure it is installed in the groove.





23. Using a 9/16” socket (PN 103006) attached to a torque wrench, tighten the fill port to **120 ± 3 inch-pounds (13.6 ± .3 Nm).**



24. Install a new, lubricated o-ring (28) onto the dial gauge (30).



NOTE - *Chrome pressure gauge used for clarity.*

25. Thread the dial gauge (30) into the upper HP port and tighten using a 7/8” crowfoot (PN 9-43628) on torque wrench. **Torque to 90 ± 5 inch-pounds (10.2 ± .6 Nm).**

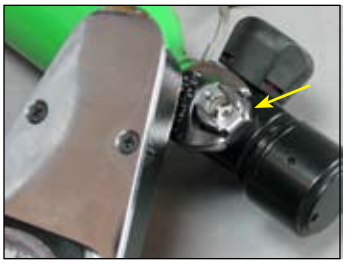


CAUTION - Avoid damaging the fill port adapter with the wrench.

26. If removed, wrap the Q.D. connector (9) with 3 1/2 to 4 1/2 revolutions of oxygen compatible ¼” Teflon tape (PN 102959).



27. Torque the Q.D. connector (9) with torque wrench and a 5/8” crowfoot (PN 103009) to about **60 ± 3 in-lbs (6.78 ± .3 Nm)** or until the lever is near the up position. If required, use the 5/8 crowfoot (PN 103009) and flex wrench (PN 103045)to rotate the Q.D. connector clockwise so the release lever is in the up position.



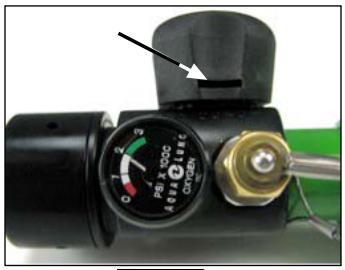


CAUTION - The lever button can be damaged if the wrench placement is not correct. **DO NOT OVER TIGHTEN.**

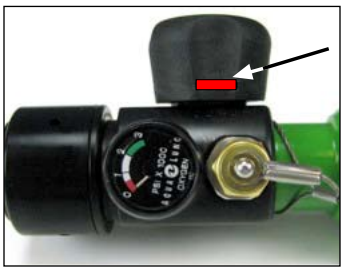
This Concludes PHODS Regulator Assembly

PHODS First Stage Testing

1. Cycle handwheel on-off several times; check RED indicator ring function. Turn handwheel until valve is closed.



ON



OFF

2. Remove fill port cap. Attach fill adapter. Fill cylinder to 2100 psi (145 bar). Turn off supply, bleed line pressure. Listen to the unit for leaks.

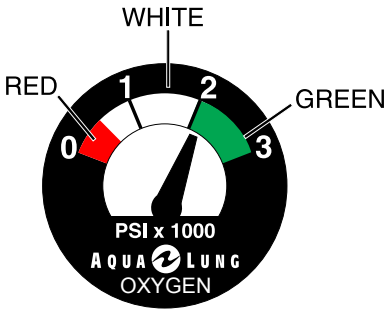


3. Attach IP. gauge (PN 102969) to the regulator. Turn handwheel slowly to open the valve. Check IP is 25±10 psig (1.7±.69 bar) Close valve, open IP gauge bleeder valve to relieve pressure. Fill IAW with local directives.





4. Refill the PHODS Cylinder to 2100 psi (145 bar). Turn valve to "ON" position and check dial gauge (30) for accuracy.



NOTE - *Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

5. Submerge system in fresh water to check for leaks for one minute minimum. Remove from water.



6. Leave in "ON" position at a stable temperature for a minimum of 12 hours. Recheck dial gauge (30) to ensure no oxygen loss.



7. If leaks detected, refer the to troubleshooting section in this Technical Manual, p. 50.

PHODS Regulator & Cylinder Final Assembly

1. Ensure all the water has been expelled from the cap (2). Install the cap protector (1) over the piston cap (2).



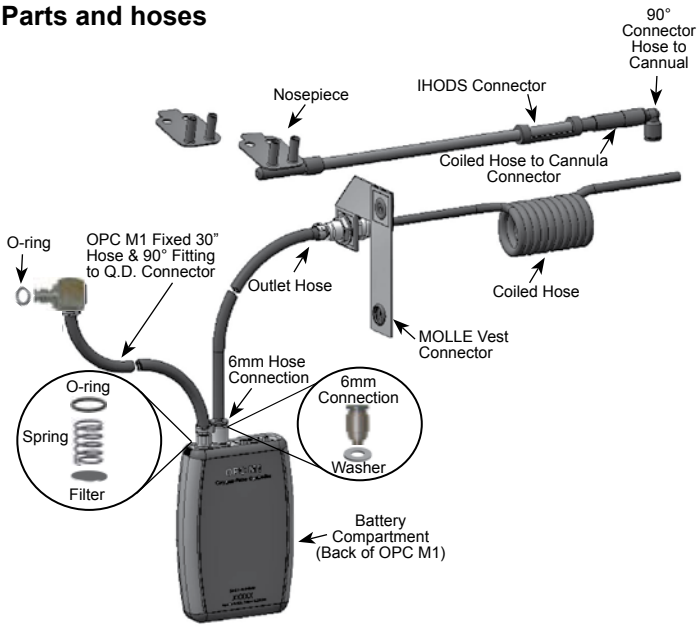
2. Screw on the fill port cap.



This Concludes PHODS Regulator Testing

Oxygen Pulse Controller (OPC)

Parts and hoses



Battery Removal

1. Remove the battery door by pressing down gently on the battery cover flange; slide the door out and away from the unit. Ensure the ribbon is positioned under the batteries towards the right side (the ribbon is used to facilitate battery removal). Pull up on the ribbon and remove the bottom battery from the right, and then remove the second battery. Replace the battery door by sliding the door in until it snaps in place. Take care when removing and replacing the batteries as to not damage the batteries and/or connectors.



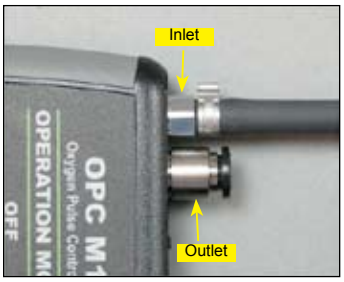


NOTE - *Batteries fit tightly, handle with care.*

CAUTION - Batteries need to be removed prior to any maintenance or storage of the OPC-M1. Failure to do so may cause irreversible damage to the OPC-M1.

OPC-M1 Disassembly

1. Take note of the OPC inlet hose fitting & 6mm outlet fitting (39).



2. Insert a 3mm hex socket (PN 103008) into the 6mm connection (39). Turn the hex socket in a counter clockwise to remove. Once the 6mm connector is removed, you should find a gasket attached. Discard both the gasket and 6mm connection.







6mm connector and gasket shown separated for clarity

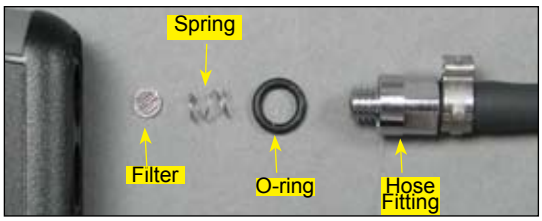
CAUTION - Ensure the 3mm hex socket is completely inserted into the center of the 6mm connector (39). Failure to do this will result in damage to the 6mm connector.

3. Use the 3/8" Crowfoot (PN 103011) and Flex wrench (PN 103045) to remove the supply hose (36). Ensure the crowfoot wrench is securely on the fitting. Turn counter clockwise to remove.





4. Remove the filter & spring (38) from inside the OPC M1 and the o-ring (37) from the end of the hose.



5. Remove the o-ring (34) from the end of the 90° fitting.




6. Remove the o-ring (34) from the end of the coiled hose fitting.

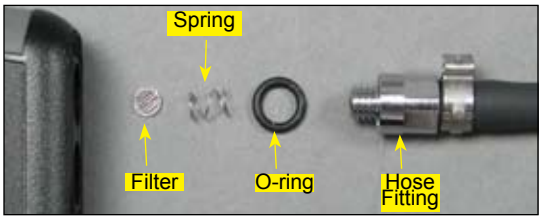


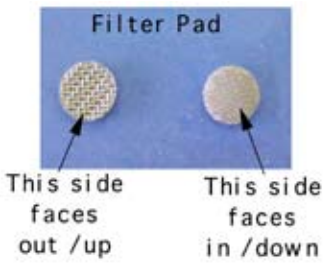

NOTE - *White connectors used for clarity.*

This completes the disassembly of the OPC & Hoses - clean as required in accordance with Procedure A Cleaning and Lubricating P. 56.

OPC-M1 Assembly

1. Using Kit PN 102950, install the new filter (rough side up) & spring (38) inside the OPC M1. Install a new o-ring (37) on the end of the hose (36).





2. Using the torque screwdriver w/ ¼" Adapter (PN 103014), ¼" x 3/8 " adapter (PN 103004) and the 3/8"crowfoot (PN 103011) from the PHODS. tool kit (PN 102968). Torque the fitting to **17 in.lbs. ± 2.**



NOTE - *The Torque Driver should be pre-set to 17 in.lbs. If not follow the directions in the tool kit to properly adjust the Torque Driver.*

3. Install a new 6mm fitting with gasket (39). Using the torque screwdriver (PN 103014) and 3mm hex socket (PN 103008), Torque the 6mm fitting to **17 in. lbs. ± 2.**





NOTE - *The 6mm fitting comes with the gasket (39) installed. Shown separate for clarity.*

4. Install a new o-ring (34) on the end of the 90° fitting.




5. Install the o-ring (34) on the end of the coiled hose fitting.




NOTE - *White connectors used for clarity.*

Battery Replacement

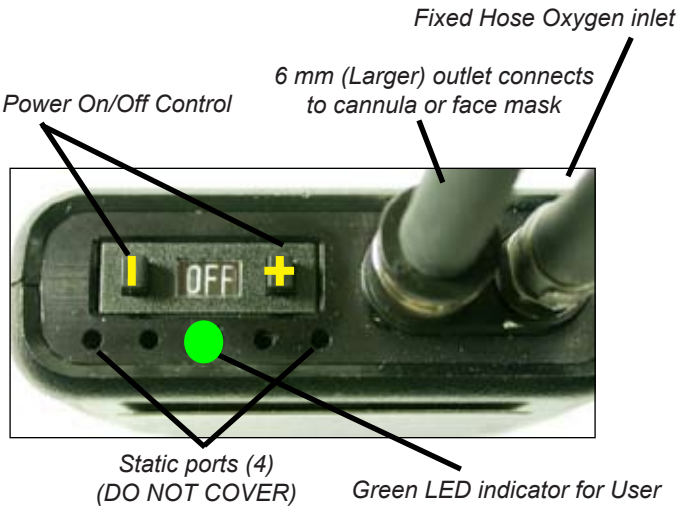
1. Remove the battery door by pressing down gently on the battery cover flange; slide the door out and away from the unit. The OPC M1 unit uses two (2) AA alkaline batteries. Insert the batteries as shown on the label inside the battery compartment (they will be a tight fit). Ensure the ribbon is positioned under the batteries toward the right side (the ribbon is used to facilitate battery removal). Replace the battery door by sliding the door until it snaps in place. Take care when removing and replacing the batteries as to not damage the batteries and/or connectors.







OPC Functional Test



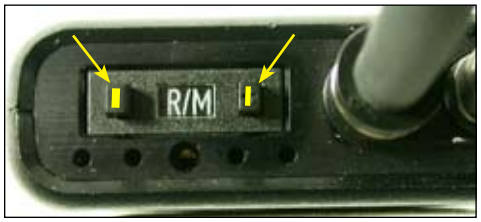
1. Connect the OPC-M1 & Inlet Hose (40) to the Regulator and Cylinder. Connect the Outlet Hose (35) to the OPC. Connect the Coiled Hose (33) to the Outlet Hose (35). Connect a Cannula (32) to the Coiled Hose (33).



2. Press the " I " button and turn the unit to the ON mode. The LED should flash rapidly, an audible alarm should sound & a puff of air should be emitted from the cannula via the OPC. The LED will continue to blink, indicating no flow. If the LED & Audible Alarm continue rapidly and the Valve continues to pulse, replace the batteries before continuing. Severely depleted batteries will only flash the LED, replace the batteries before continuing.



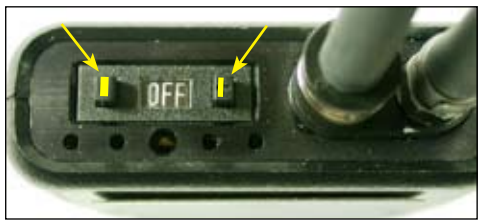
3. Press the " I " button and turn the unit to R/M. This will allow the unit to provide a puff of air while breathing the unit.



4. Press the " I " button and turn the unit to F20. This will allow the unit to provide a very small puff of air while breathing the unit.



5. Upon successful completion of the OPC Operational test, push the "+" three (3) times to turn the OPC 'OFF'.



HOSE REPAIR

1.To remove the Oetiker clamp;

a.Assemble the 4 in 1 Screwdriver with the large flathead out

b.Slide the 4 in 1 Screwdriver under the tab of the Oetiker Clamp carefully to avoid injury and lift the tab until the clamp disengages from itself.

c.Lift the end of the Clamp up and remove it. If you slide it up, the small spring section of the clamp may puncture the outer case of the hose.

d.Soak the end of the hose in hot water for 1 minute.

e.Remove the hose end from the hot water. Wrap the fitting with a clean towel and remove the fitting by pulling it from the end of the hose. Avoid direct contact with the hot water.

2.To install the new hose fitting:

a.Slide the Oetiker Clamp up the hose no more than ¾”

b.You may have to twist the clamp but use caution not to slide the outer cover of the hose up; if you do, pull the outer jacket back into place. NOTE: The Coiled Hose has no outer jacket.

c.Push the appropriate fitting into the hose until it stops.

d.Work the clamp down to within ⅛” of the fitting collar

e.Using the provided Oetiker Clamp Pliers, squeeze the protruding part of the clamp until it stops.

f.Inspect the hose assembly and ensure there are no cuts or bunched hose.

3.To repair P/N102958 Hose Assy, OPC Outlet

a.Follow step 1.a. through 2.f. for the Q.D. fitting.

b.To prepare the end that goes into the OPC, using a very sharp knife or razor knife, carefully cut around the black outer jacket of the hose, 5/8” from the end and remove the black outer cover.

- OPC Outlet Hose Clamp P/N102947
  CLAMP, OETICKER STEPLESS, 8.7MM
- Coiled Hose Clamp P/N 102946
  CLAMP, OETICKER STEPLESS,7MM

WARNING - DO NOT modify or alter the length of any hoses or tubing. This should only be done by a qualified technician, using original manufacturer hose assemblies.

WARNING - DO NOT increase or decrease the length of the Nasal Cannula or the coiled hose. The removable Nose Piece may be trimmed for comfort.

PHODS Mask

1. The PHODS Tool Kit, PN 102968, contains the tools required for the maintenance of the PHODS Mask, including the inhalation & exhaust valves, the inlet elbows and the microphone maintenance.

2. For general maintenance of the PHODS Face Mask, see Appendix A.



Modifying MFS for use with PHODS Mask

1. Remove the existing latch assemblies by removing the screws and posts that secure hinges to the MFS (See Fig. 50).

2. Using a #20 drill bit, ream out the existing holes in the MFS. Do not make holes any wider than #20 drill bit.

3. Insert the quarter-turn fastener stud into the MFS so that the screw head portion is positioned on the outside of the MFS.

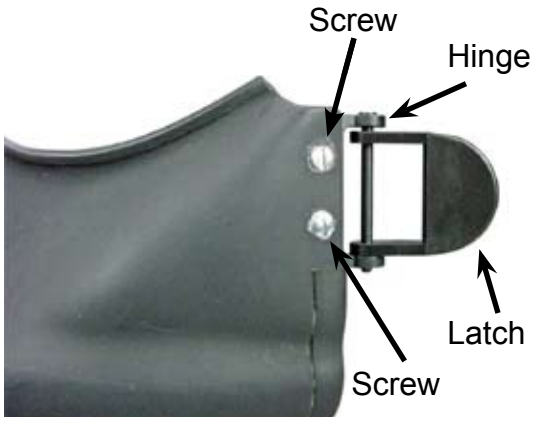


Figure 50
MFS Latch and Hardware

4. While holding quarter-turn fastener stud, place split-ring retainer over the tip of the post (See Fig. 51)

5. Align retainer installation tool over split-ring retainer (See Fig. 52).

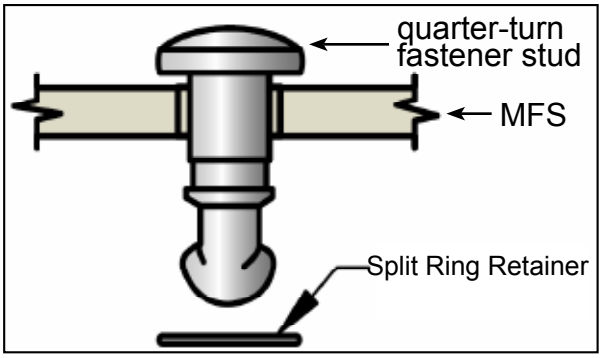


Figure 51
¼ Turn Fastener Post and Retainer

6. Apply pressure and twist the retainer installation tool until split-ring retainer snaps into position (See Fig. 53).

7. Repeat steps 4 thru 6 for remaining holes in MFS.

8. MFS is ready for PHODS Mask hardware attachment.

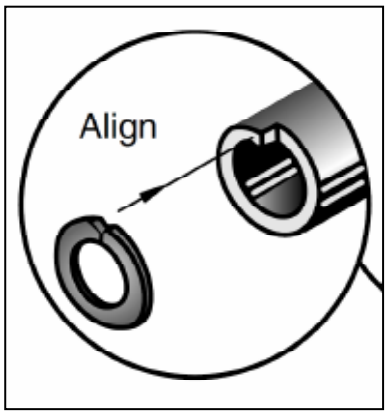


Figure 52
Installation Tool Alignment

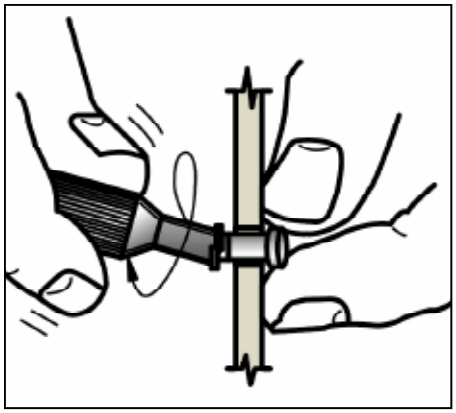


Figure 53
¼ Turn Fastener Installation

CANNULA CLIP ATTACHMENT INSTRUCTIONS

Tool required:

- Scissors
- Ruler with 1/8-inch graduations
- Pencil Short handled
- Clear tape
- Drill
- Drill bits – 1/16”, 9/64”, and 3/16”
- Philips screw driver

1. On the right ear lobe of the helmet, measure 3/4 inch from the bottom edge of the helmet in two places and connect with a horizontal line (See Figs. 54 & 55)



Figure 54

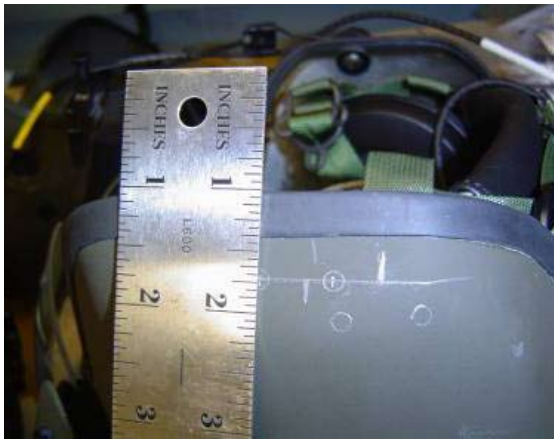


Figure 55

Installation Template Instructions (See Fig. 56)

2. Cut a piece of paper approximately 3.75” L x 1.5” W (3 3/4” L x 1 1/2” W) (See Fig. 55).

3. Place the paper with the long length vertical per Fig. 56.

4. Draw a line across the paper 0.75” (3/4”) from the bottom.

5. Draw a vertical line 0.5” (1/2”) in from the left side of the paper so it crosses the line previously draw across the bottom.

6. From the intersection of the two lines, mark a spot . 6 2 5 ” (5/8”) away from the intersection horizontal line.

7. Cut out the upper left corner on the vertical 0.5” line approximately 0.63” (11/16”) down from the top.

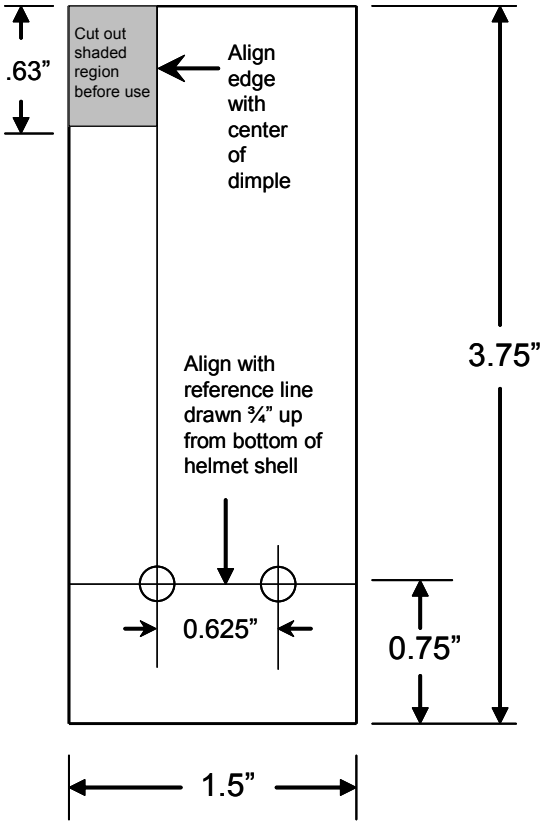


Figure 56

8. Align the 0.75” line on the template with the line drawn on the helmet (See Fig. 57).

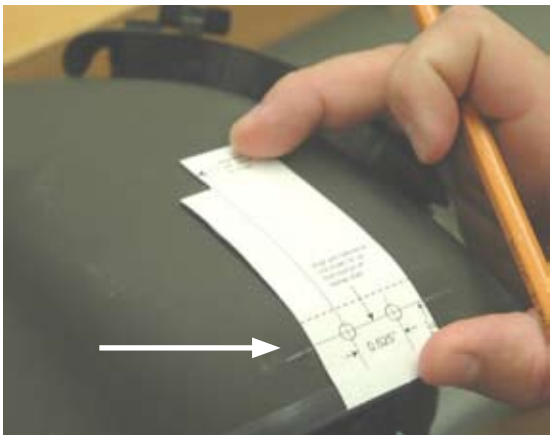


Figure 57

9. Align vertical edge of the template cut out with the dimple in the earcup (See Fig. 58).

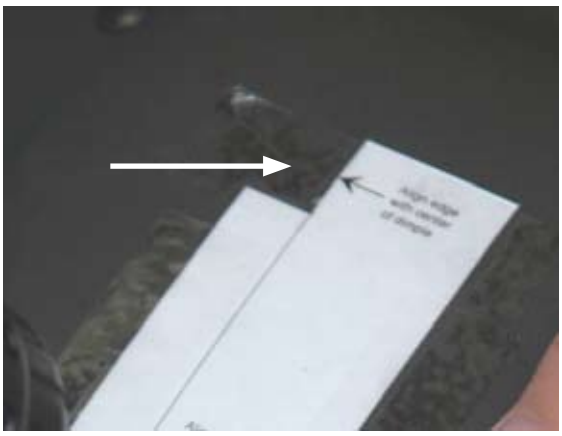


Figure 58

10. Tape template in place (See Fig. 59).

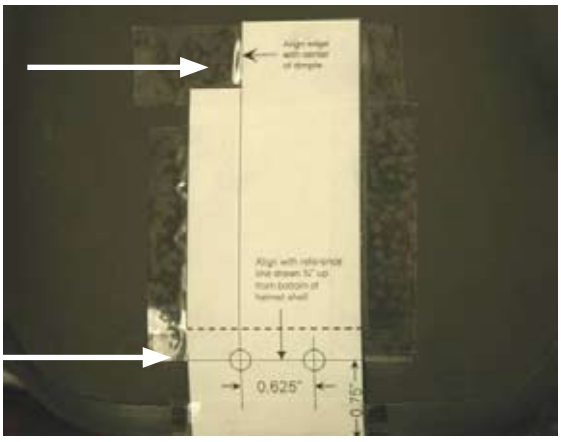


Figure 59

11. Drill holes, start with a 1/16 inch as a pilot hole. Be sure to back the hole with a piece of wood to prevent splintering (See Figs. 60 & 61).

12. Drill again with a 9/64 inch bit.

13. Finish with a 3/16 inch bit.

CAUTION - Failure to follow the drilling instructions may result in irreversible damage to the helmet.



Fig. 60



Fig. 61

14. Remove template from helmet. Remove all tape residue (See Fig. 62).

15. Insert the provided screws from the exterior, mounting the Cannula clip inside the helmet shell (See Fig. 63).

16. If CEPS is installed on the helmet, use adapter plate to route the wire clear from the cannula tube (See Fig. 64).



Fig. 62



Fig. 63



Fig. 64

TABLE 1: TROUBLESHOOTING

General Checks

WARNING - If after consulting the Troubleshooting section of this manual the situation is not resolved, immediately return the PHODS system to a qualified technician for inspection or contact an Aqua Lung Technical Advisor.

NOTE - *Due to the small size of the dial gauge, the working pressure of 2100 psi & its 5% gauge accuracy, it is possible that the needle will only go just to the green or next to it. This is acceptable provided the unit is charged on a calibrated system.*

1. Verify sufficient Oxygen is in the PHODS cylinder.
2. **Audible Alarm, Flashing LED & Pulsing Solenoid Valve continue on OPC Start-up:**
    1. Replace battteries immediately
    2. Severely Depleted batteries will only flash the LED
3. If any of the following conditions exist, descend to safer altitude as soon as possible.

The OPC M1 unit emits no audible alarm or start-up oxygen pulse when turned on:

1. Check batteries to make certain they are fresh.
2. Check oxygen cylinder valve is on.
3. Check oxygen supply tube for proper connection.
4. Check oxygen supply tube for obstructions.
5. Check OPC M1 outlet tubing for obstructions.

Audible alarm on start-up is heard, but no start-up oxygen pulse delivered:

1. Check oxygen cylinder valve is on.
2. Check oxygen supply tube for proper connection.
3. Check oxygen supply tube for obstructions.
4. Check OPC M1 outlet tubing for obstructions.

When using the face mask, no oxygen pulse on inhalation:

1. Make sure the face mask is sealed against the skin.
2. Check for obstructions on the **OPC M1** outlet tubing.
3. At altitude to allow breathing, make certain you are in “**F20**” mode.

Oxygen pulses are delivered, but the Green LED indicates no flow condition:

1. Check the batteries to make certain they are fresh.
2. Check for obstructions in the Nasal Cannula/Face Mask and tubing.

The OPC M1 does not trigger at higher altitudes:

1. Turn the OPC to the **OFF** Mode, then return to the previous mode.
2. Try a different mode.
3. Descend to a lower, safer altitude.

WARNING - Do not increase or decrease the length of the Nasal Cannula or the coiled hose. The removable Nose Piece may be trimmed for comfort.

Table 2: Torque Specifications

PART #	DESCRIPTION / KEY ITEM #	TORQUE
102954	1st Stage Body to Bottle	25 ± 3 ft/lbs (33.9 ± 2.7 Nm)
102952	Q.D. Connector (Lever up)	60 ± 3 in/lbs (6.78 ± .3 Nm)
054211	Safety Plug (1st Stage)	105 ± 5 in/lbs (11.8 ± .6 Nm)
108318	Bonnet (1st Stage)	120 ± 3 in/lbs (13.5 ± .3 Nm)
102908	Fill Port Adapter (1st Stage)	120 ± 3 in/lbs (13.5 ± .3 Nm)
102955	Dial Gauge (1st Stage)	90 ± 5 in/lbs (10.1 ± .6 Nm)
102928	OPC Inlet Fitting	17 ± 2 in/lbs (1.9 ± .23 Nm)
103044	OPC 6 mm Outlet Fitting	17 ± 2 in/lbs (1.9 ± .23 Nm)

Table 3: Test Bench Specifications

TEST	CONDITION	SPECIFICATION
Leak Test	Inlet 2100 psig (145 bar)	No leaks allowed
MP	Inlet 2100 psig (145 bar)	25±10 psig (1.7±.69 bar)

Table 4: Recommended Cleaners and Lubricants

LUBRICANT/CLEANER	APPLICATION	SOURCE
Christo-Lube MCG 111	All o-rings	Aqua Lung, PN 820466, or Lubrication Technologies 310 Morton Street Jackson, OH 45640 (800) 477-8704
CAUTION: Silicone rubber requires no lubrication or preservative treatment. DO NOT apply grease or spray to silicone rubber parts. Doing so may cause a chemical breakdown and premature deterioration of the material.		
Oakite #31	Acid bath for reusable stainless steel and brass parts.	Oakite Products, Inc. 50 Valley Road Berkeley Heights, NJ 07922
CAUTION: Do not use muriatic acid for the cleaning of any parts. Even if strongly diluted, muriatic acid can harm chrome plating and may leave a residue that is harmful to o-ring seals and other parts.		
White distilled vinegar	Acid bath for reusable stainless steel and brass parts.	“Household” grade
Non-ionic Liquid dishwashing detergent (diluted with warm water)	Degreaser for brass and stainless steel parts; general cleaning solution for plastic and rubber.	“Household” grade

Table 5: List of Tools and Service Kits

PART #	DESCRIPTION	APPLICATION
100398	Vise Adapter 	Cylinder Removal/Installation
102969	Gauge, M.P. PHODS O2C 	Test Intermediate Pressure (IP)
107394	Adjustable Spanner Wrench 	Regulator Cap Removal
103004	1/4”F - 3/8”M Adapter 	Adapt Torque Driver to 3/8” Crowfoot
9-43001	3/8” Socket 	Burst Plug Assembly Removal/Installation
103008	3mm Hex Socket 	OPC 6mm Connector Removal/Installation
103006	9/16” Deep 12 pt. Socket 	Regulator Bonnet Removal/Installation
FC38A	1 3/16” Crowfoot 	Regulator Body Removal/Installation
9-43628	7/8” Crowfoot 	Dial Pressure Gauge Removal/Installation
103009	5/8” Crowfoot 	Q.D. Connection Removal/Installation
103011	3/8” Crowfoot 	OPC Inlet Connection Removal/Installation

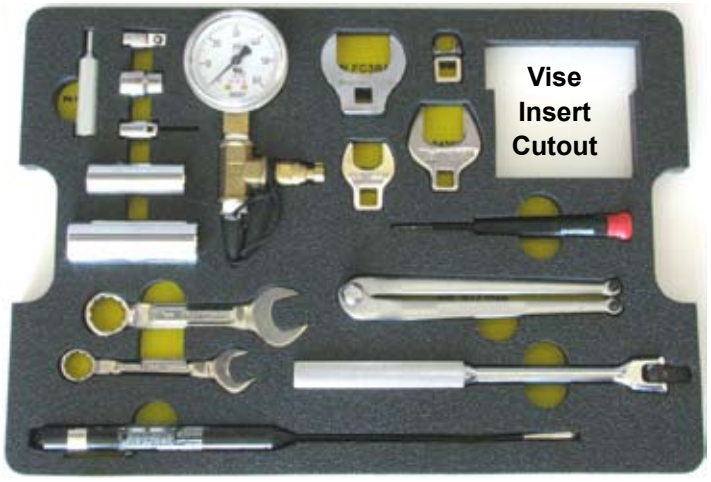
Table 5: List of Tools and Service Kits (continued)

PART #	DESCRIPTION	APPLICATION
103045	Flex Wrench 3/8", 8.5" 	Socket & Crowfoot Handle
945734	Precision Screwdriver 4-in-1 	PHODS Mask & Shield
944118	17mm Combination Wrench 	PHODS Mask 6mm Elbow Inside Nut
944115	13mm Combination Wrench 	PHODS Mask 6mm Elbow Outside Nut
103013	Inspection Light 	Cylinder Inspection
941586	Medium Blade Modified Screwdriver 	Handle Retaining Nut Removal/Installation
944022	O-ring Tool Set, Brass 2 pcs 	O-ring Removal/Installation
10-102-400	O-ring Tool SS Hook 	O-ring, Hose, Removal/Installation
109437	Seat Extraction Tool 	HP Seat Removal
103014	Adjustment Tool Torque Driver 	Apply Installation Torque to OPC Outlet w/ 3mm Hex Socket
103016	Torque Driver Socket Adapter 	Apply Installation Torque to OPC inlet w/ Torque Driver & 3/8" Crowfoot

Table 5: List of Tools and Service Kits (continued)

PART #	DESCRIPTION	APPLICATION
103012	Pinch Clamp Pliers 	Installation of Hose Clamps
102992	Mask Tool 	PHODS Mask
9-BA819008	Magnifier w/ Illumination 	Sealing Surface & Crown Inspection
824466	Christo-Lube MCG 111, 2oz Tube 	Lubrication of O-rings & Parts
103049	MFS Retainer Installation Tool 	Installation Tool for MFS 1/4 turn fastener washer
102990	Service Kit, Regulator, PHODS	For Service of the PHODS Regulator, OPC and Hoses

PHODS Tool Kit
PN 102968





SPECIFICATIONS

Maximum respiration rate: The OPC M1 at power up will allow up to 20 BPM. As the user breathes faster, the unit will compensate and allow up to 45 BPM.

Apnea time-out: Approximately 30 seconds. Apnea alarm will flash a Green LED in the "**ON**" mode if your actual pressure altitude is below the 10,000 ft. altitude setting and/or you are not breathing normally through the cannula or mask.

Operating inlet pressures: 15 -25 psi. At higher inlet pressures the valve may open to relieve the pressure and the unit will not operate correctly.

Battery type: 2 Standard AA alkaline DURACELL© type MX1500 or equivalent.

Operating Voltage: 3 VDC

On Start -Up Battery Low Voltage warning:- Less than 4 hours duration remaining- LED flashes rapidly, Alarm continues to sound & Solenoid Valve continues to pulse. Severely depleted batteries will only flash the LED.

Operational Low-Voltage Warning: 4 ~ 8 hours remaining - 1 flash of the Green LED every 2 seconds. **Replace batteries as soon as practical.**

Operational Extreme Low-Voltage Warning: 1 ~ 2 hours remaining - 2 flashes of Green LED every 2 seconds. **Batteries must be replaced as soon as possible.**

Dead Battery: OPC M1 Stops delivering oxygen. **Batteries must be replaced IMMEDIATELY.**

Battery Life: 100 Hours @ 77ºF (25ºC). operating, assuming fresh alkaline batteries under normal conditions.

Storage: The OPC M1 will not draw any current during storage while in the "**OFF**" setting.

Physical characteristics

MH OPC M1 unit:

Width: 3.15" (8.0 cm.)

Height: 5.25" (13.2 cm.) enclosure and ports

Depth: .93" (2.23 cm.)

Weight: 8.2 oz. (0.233 kg.) with batteries

PHODS Regulator and Cylinder

Pressure Rating: 2100 psi (145 bar)

Capacity:1.7 Cu. Ft. (48.36 Liters)

Floodable Volume: 20.4 Cu. In. (.334 liters)

Height: 12.00" (30.48 cm) [Cylinder-9.25"(23.5 cm) & Regulator-2.75"(6.99 cm)]

Diameter: 2.00"(5.08 cm)

Weight: Empty 2.47 lbs (1.12 kg.) Full approx. 2.5 lbs (1.13 kg)

Testing and characterization was done under normal operating conditions i.e. 77ºF (25ºC) and responding to a respiration rate of about 15 breaths per minute. Specifications are subject to change without notice.

Procedure A: Cleaning and Lubricating

Oxygen Safe Area Guidelines

Components requiring O2 cleaning must be disassembled, cleaned and assembled in a designated “O2 Safe Area”; with the following minimum requirements:

- An enclosed work area.
- No oil or grease within the immediate work area.
- As free as possible of dust and dirt.
- A clean, non-porous work surface.
- Personnel traffic must be restricted from the area.
- Tools shall be clean, non sparking and designated for “O2 USE ONLY”.
- Personnel shall clean hands, face (no makeup) and wear clean clothing.
- Area shall be clearly marked: “RESTRICTED - O2 SAFE AREA” “NO SMOKING, CHEWING, EATING OR DRINKING”.

Cleaning Brass and Stainless Steel Parts

1. Preclean in warm, soapy water* using a nylon bristle tooth brush. If there are stubborn deposits, household white distilled vinegar (acetic acid) in an ultrasonic cleaner will work well.
2. Thoroughly clean parts in an ultrasonic cleaner filled with an oxygen compatible solution for 5-15 minutes.
3. Remove parts from the ultrasonic cleaner and rinse with fresh water. If tap water is extremely “hard,” place the parts in a bath of distilled water to prevent any mineral residue. Agitate lightly, and allow to soak for 5-10 minutes. Remove and blow dry with low pressure (25 psi) filtered air, and inspect closely to ensure proper cleaning and like-new condition.

Cleaning Plastic & Rubber Parts

Parts made of plastic or rubber may be soaked and cleaned in a solution of warm water mixed with mild dish soap. Use only a soft nylon toothbrush to scrub away any deposits. Rinse in fresh water and thoroughly blow dry, using low pressure filtered air.

> ⚠ **CAUTION -** Do not place plastic and rubber parts in acid solutions. Doing so may alter the physical properties of the component, causing it to prematurely degrade and/or break.

*Soapy water is defined as “household” grade liquid dishwashing detergent diluted in warm water.

Procedure A: Cleaning and Lubricating (Continued)

Cleaning Hoses

1. If corroded, soak hose ends only in ultrasonic cleaner.
2. Do not allow cleaner to enter hose more than necessary.
3. Thoroughly rinse with fresh water.
4. Allow to dry with fittings hanging down.
5. Blow out hose before installing.

Lubrication and Dressing

Wear powder free latex gloves when handling and lubricating o-rings. Keeping internal parts free from skin oils and other contaminants is important when running oxygen through a first stage. All o-rings should only lubricated with Christo-Lube® MCG-111. This is an oxygen compatible lubricant. Dress the o-rings with a very light film of grease, and remove any visible excess by running the o-ring between thumb and forefinger. Avoid applying excessive amounts of Christo-Lube® grease, as this will attract particulate matter that may cause damage to the o-ring.

CAUTION - Do not lubricate the safety plug assembly.

STORING THE OPC M1

When not being used, the OPC M1 unit, oxygen hoses, Nasal cannulas, etc., should be disconnected from the oxygen supply and stored in a secure manner to ensure that dirt and debris do not enter the inlet and outlet tubes. The supplied Storm Case is recommended (See Fig. 49) or zip-top plastic bags are good alternative storage containers.

> ***NOTE*** *- If the OPC M1 is not going to be used for 30 days or more, remove the batteries. When using the OPC M1 for the first time after storage, replace the batteries to ensure proper operation. A fresh set of batteries should be part of your pre-flight inventory.*

> ***NOTE*** *- The unit should not be stored with oxygen in the cylinder. Instead, store with oxygen compatible air or dry nitrogen. When put back into service, be sure to purge the cylinder and regulator prior to filling with oxygen for use.*

STORING THE PHODS SYSTEM

The PHODS system can be stored under a fairly wide temperature range. To protect the system from excessive humidity/rain, etc. store the unit in the supplied case. The High temperature should not exceed 185°F (+85°C) & the Low temperature should not be lower than -79.6°F (-62°C) . In practical use the following precautions should be observed:

1. Batteries should be removed from the OPC if possible for extended storage at temperatures below 32°F, if that is not possible, the unit should be rewarmed before use. The unit has been tested to be operational to -25 °F, however warmer operating temperatures give longer battery life. If you preflight with fresh batteries then this should not be a problem.

2. Always store Cylinder regulator with ON/OFF valve in OFF on regulator, this will assure Oxygen fill level cannot leak in any manner.

3. Unit can be tested in R/M mode before use at low altitude to verify functionality.

CARE & MAINTENANCE

The PHODS system should be returned to its protective case when not in use (See Fig. 49).

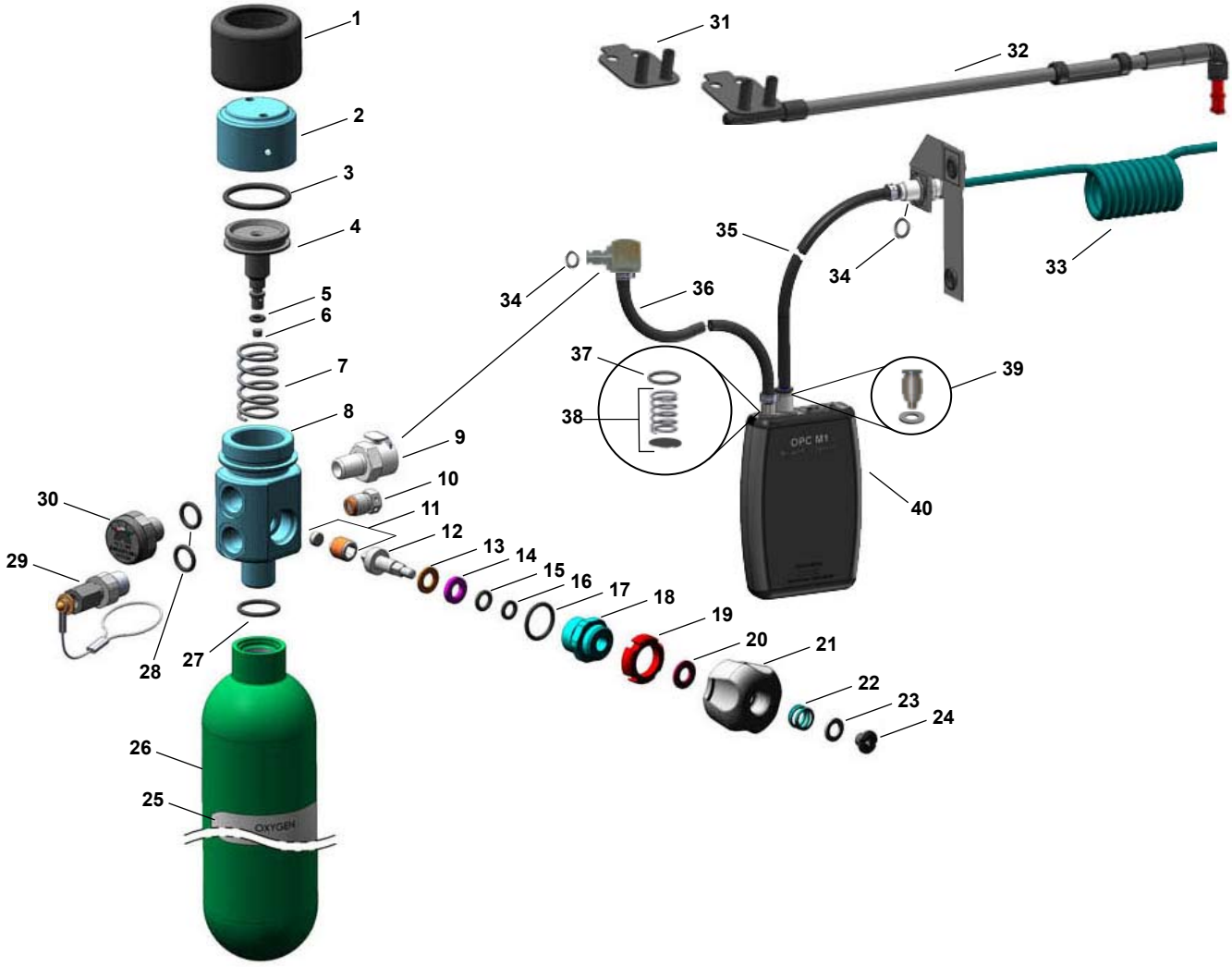
It is important to provide the proper preventative maintenance in order to ensure the best possible performance and reliability of the PHODS.

OBTAIN FACTORY PRESCRIBED SERVICE BY A QUALIFIED TECHNICIAN FOR YOUR PHODS AT LEAST EVERY 12-18 MONTHS. YOUR PERSONAL SAFETY AND THE MECHANICAL INTEGRITY OF YOUR PHODS DEPENDS ON IT.



Figure 49

PHODS REGULATOR SCHEMATIC



Key # . Part #	Description
.....102940	Regulator w/cylinder PHODS
.....102990	**Service Kit, Regulator, PHODS**
1 108302	Cover, Retainer
2 108303	Cap, Retainer, Complete
3 820320	***O-ring***
4 106769	Piston
5 .....820007P	***O-ring (20pk)***
6 106726	***HP Seat, Piston***
7 102901	Spring
8 102954	Body
9 102952	Connector-CPC-MCD 1002
10 054211	***Safety Plug, 2250 PSI***
11 102941	***Retainer Assy, Seat Disc***
12 108319	Stem, On/Off
13 108327	***Washer, Stem, Bottom, Teflon***
14 108328	Washer, Stem. Top Brass
15 .....820010P	***O-ring(25 pk)***
16 828009	***Ring, Back-Up***
17 .....820015P	***O-ring(10 pk)***
18 108318	Bonnet Complete
19 108317	Ring On/Off Indicator
20 108326	Washer, Stem, Top, Nylon

Key # . Part #	Description
21 108313	Handwheel Assy, On/Off
22 108316	Spring, On/Off
23 108329	Washer, Handwheel, Top
24 108304	Retainer, Handwheel, Black
25 102917	Sticker, O2C Cyl. PHODS
26 102930	Cylinder, Steel
27 .....820316P	***O-ring(10 pk)***
28 .....820319P	***O-ring(10 pk)***
29 102908	Fill Port w/ Cable PHODS O2C
30 102955	Gauge, Dial 3000 PSI O2 (spare)
.....102950	**Service Kit, OPC-M1, PHODS**
31 102906	Nosepiece, (1 pk)
32 102980	Cannula Assy, (w/o Clip) w/ Nosepiece
33 102957	Hose Assy, 6mm Coiled
34 820008	***O-ring***
35 102958	Hose Assy, (OPC M1 Outlet)
36 102960	Hose Assy, CYL-OPC, Spare
37 820098	***O-ring***
38 102966	***Spring & Filter***
39 103044	***Connector, 6mm & Washer***
40 102970	Controller OPC-M1 w / hose
N/S 103066	OPC-M1 Battery Door

Part numbers in ***BOLD ITALICS*** indicate standard overhaul replacement part.

APPENDIX A

PHODS MASK ASSEMBLY
OPERATION AND MAINTENANCE INSTRUCTIONS
WITH ILLUSTRATED PARTS BREAKDOWN

AQUA LUNG AMERICA PART NUMBERS:

PN 102971 - MASK,ORAL NASAL W/56P,SM-N,PHODS
PN 102972 - MASK,ORAL NASAL W/56P,MD-N,PHODS
PN 102973 - MASK,ORAL NASAL W/56P,MD-W,PHODS
PN 102974 - MASK,ORAL NASAL W/56P,LG-W,PHODS

PN 103022 - MASK,ORAL NASAL W/SNAP MOUNT,SM-N,PHODS
PN 103023 - MASK,ORAL NASAL W/SNAP MOUNT,MD-N,PHODS
PN 103024 - MASK,ORAL NASAL W/SNAP MOUNT,MD-W,PHODS
PN 103025 - MASK,ORAL NASAL W/SNAP MOUNT,LG-W,PHODS

PN 103026 - MASK,ORAL NASAL W/MFS MOUNT,SM-N,PHODS
PN 103027 - MASK,ORAL NASAL W/MFS MOUNT,MD-N,PHODS
PN 103028 - MASK,ORAL NASAL W/MFS MOUNT,MD-W,PHODS
PN 103029 - MASK,ORAL NASAL W/MFS MOUNT,LG-W,PHODS

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CHAPTER 1

INTRODUCTION AND GENERAL INFORMATION

1.1 Introduction

This manual covers operation, fitting, inspection, and maintenance instructions, with illustrated parts breakdown, for the Portable Helicopter Oxygen Delivery System (PHODS) Oxygen Mask Assembly, part numbers: 102971, -72, -73, -74, 103022 -23,-24,-25, (Ref. Figure 1-1a) and 103026, -27, -28, -29, (Ref. Figure 1-1b).

1.2 General Information

The PHODS will provide needed oxygen to the user on demand when atmospheric oxygen is insufficient for the user to maintain adequate mental and/or physical performance. This is done by injecting a puff of pure oxygen into the mask cavity, mixing it with ambient air, for inhalation by the wearer to maintain needed blood oxygen levels, comparable to those of sea level. Use of a mask will supply an adequate oxygen mixture to users who are under mental or physical stress and who, as a result, will breathe through their mouths instead of their noses.

The Oxygen mask design includes the mounting brackets necessary to connect the mask to the HGU-56/P helmet with or without the Maxillofacial Shield installed and also includes the snap adapters to connect the mask to the HGU-84/P helmet without the Maxillofacial Shield installed. This provides versatility to aircrew members allowing them to specialize the system according to mission demands. The system remains stable throughout the flight performance envelope of helicopters, is easy to don, and has quick disconnect features. The mask assembly's quick release snaps and adjustable fasteners allow three unique configurations wherein the Maxillofacial Shield and oxygen mask can be used independently or together for maximum protection.

1.3 Qualification Statement

The maintenance of equipment as described in this manual shall be performed by experienced life support technicians in accordance with this document.

1.4 Leading Particulars

The leading particulars are provided in Table 1-1.

1.5 Consumables

A list of consumable materials is contained in Table 1-2. Equivalent consumables may be substituted for the items listed.

1.6 Unauthorized Hardware Modifications

Customers are advised not to perform alterations or modifications to the mask or its subassembly components, other than as described in this manual, without prior approval of Aqua Lung America & Gentex Corporation. Unauthorized modifications will void any and all warranty claims with the PHODS.

1.7 Abbreviations and Acronyms

Abbreviations and acronyms contained in this manual are listed in Table 1-3.

PHODS MASK



Figure 1-1a
Mask Assembly, Oxygen, PHODS, HGU- 84/P Usage

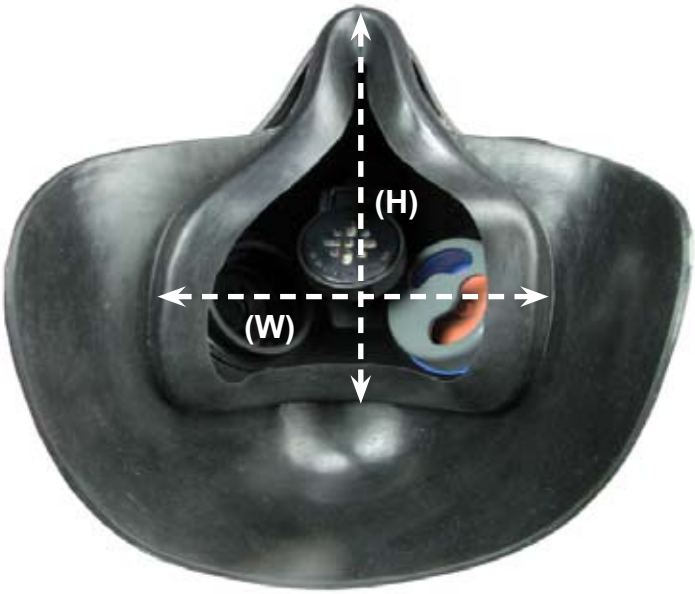


Figure 1-1b
Mask Assembly, Oxygen, PHODS, HGU- 56/P Usage

Table 1-1

Leading Particulars

Item	Particulars
PHODS Oxygen Mask Assembly 102971/-74	►Available in multiple sizes ►Oxygen is provided to the wearer by the PHODS O2 system via the mask ►Equipped with a dynamic microphone



Mask Assy. Part No.	Mask Size	Height (H) mm (inches)	Width (W) mm (inches)
102971	Small Narrow	85.7 (3.37)	79.4 (3.13)
102972	Medium Narrow	85.7 (3.37)	82.6 (3.25)
107973	Medium Wide	95.3 (3.75)	88.9 (3.50)
107974	Large Wide	108.0 (4.25)	88.9 (3.50)

Figure 1-2

Width and Height Dimensions of Face seal

Table 1-2

Consumables

Nomenclature	Material	Specification Number	Item (P/N or NSN equivalent may be substituted)
Pads, gauze	Non-sterile gauze		NSN 6510-00-782-2698
Lint-free wipes		UU-T-595	NSN 7920-00-682-6710
Detergent, dish washing	Ivory® or Joy®		NSN 7930-00-764-5076
Alcohol, isopropyl	70% solution	MIL-I-37443	NSN 6505-00-655-8366
Swabs, cotton			NSN 6515-00-303-8250
Thread, tacking	Waxed thread	A-A-52094 (V-T-276 Type IVB ticket 8/4)	NSN 8310-01-063-5934
Epoxy			NSN 8040-00-753-4800
320 grit or finer sandpaper			Local Purchase
Emery cloth			Local Purchase
Sea Drops™ and MicroNet™			McNett Corporation®, Bellingham, WA

Table 1-3

Acronyms and Abbreviations

Acronym / Abbreviation	Definition
alt.	Alternate
AR	As Required
assy.	Assembly
CAGE	Commercial and Government Entity
comm.	Communications
H	Height
in-oz	Inch Ounces
in-H_2O	Inches-Water
MFS	Maxillofacial Shield
mm	Millimeters
MPL	Maintenance Parts List
NSN	National Stock Number
O2	Oxygen
PHODS	Portable Helicopter Oxygen Delivery System
opt.	Optional
W	Width

CHAPTER 2
SPECIAL TOOLS AND TEST EQUIPMENT

2.1 General Requirements

This section lists and illustrates special tools and test equipment required for maintenance of the PHODS. If the recommended tools/test equipment is not available, equivalent items may be used.

2.2 Special Tools

Refer to Table 2-1 for special tools required for maintenance of the PHODS.

Table 2-1
Special Tools

Aqua Lung/Manufacturer P/N	Nomenclature	Use and Application
102992	Mask Valve Tool	Provides for special tools to accommodate oxygen mask maintenance
945734	4 way Screwdriver	Tightening of microphone attachment screws

2.3 Special Test Equipment

No Special Test Equipment is required

CHAPTER 3

PREPARATION FOR USE, STORAGE AND SHIPMENT

3.1 Unpacking

1. Remove the oxygen mask from the shipping box and plastic bag.
2. Prior to use, visually inspect the mask for damage incurred during shipment or storage. Inspect for system completeness, cleanliness, and deterioration.
3. Check for cracks, punctures, or tears in the silicone rubber parts.
4. Check for loose connections of the inhalation and exhalation valves to the mask, two side-mounted 90 degree oxygen inlet ports of the mask and the upper and lower strap assemblies to the hardshell. Tighten any loose connections.
5. Check mask snaps & strikers for proper operation.
6. Prior to issue, perform complete inspection in accordance with paragraph 5.2.
7. Test mask assembly to ascertain that it is functioning properly in accordance with paragraph 4.13.

3.2 Preparation for Storage

1. Disinfect mask in accordance with paragraph 4.12.
2. Place mask in a Ziploc® sealing bag or suitable substitute bag.
3. Place mask in a suitable box or container which will prevent distortion, bending, or flattening of the mask.
4. Seal the box or container.
5. Stores mask assembly in a cool, dry atmosphere and out of direct sunlight.

3.3 Preparation for Shipment

1. Disinfect mask in accordance with paragraph 4.12.
2. Place mask in a Ziploc® sealing bag or suitable substitute bag.
3. Place mask in a suitable box or container which will prevent distortion, bending, or flattening of the mask.
4. Seal the box or container.

CHAPTER 4

OPERATION INFORMATION

4.1 Theory of Mask Assembly Operation (Figure 7-1)

Oxygen enters from the Man Mounted Regulator hose and travels through 90 degree oxygen inlet port of the face piece to allow the oxygen to enter the mask cavity. Exhaled gasses exit the mask through the exhalation valve.

The mask includes an integrated M-169A/AIC dynamic 5-ohm microphone to aid communications.

4.1.1 Operation of the Valve Assembly

The user will pull ambient air into the mask through the inhalation valve assembly by breathing normally. The inhalation valve assembly is designed to crack open at approximately 0.5 in-H_2O vacuum.

4.2 Inspection and Test Requirements

WARNING - Disinfect oxygen mask after each use to avoid bacteriological contamination and for cleanliness (Ref. paragraph 4.12).

Checkout and testing (Ref. paragraph 4.13) of the mask shall be accomplished whenever:

a. Maintenance procedures in Chapter 5 of this manual have been performed.

b. Mask is initially issued/placed into service.

c. The mask has not been used for 30 or more days.

d. The mask or any sub-assembly components malfunction.

4.3 Sizing

For the 102971 thru 102974, there are four mask sizes from which to choose for achieving an optimum fit, (Ref. Table 4-1). A measurement caliper is used to determine the initial choice of mask size. Select a mask size using the procedures as described in paragraph 4.4.

4.4 Measurement and Fitting

WARNING - An improperly fitted mask could result in a loss of altitude protection and possible injury to the wearer.

1. The subject's facial muscles should be relaxed and jaws should be positioned as comfortably as possible when wearing a mask. Using measurement calipers, measure the distance from the nasal root to the supramentale (Ref. Figure 4-1a). If using a non-scaled caliper, lay caliper onto a ruler or similar scale to determine length. Compare measurements to a standard millimeter scale and determine the size of the mask to be fit.

2. Select the initial size mask as indicated by the measurements. A person near a size boundary should try both sizes for comfort before selecting one for fitting. The choice of medium narrow or medium wide is subjective. However; for the best seal, it is advisable to use the medium narrow unless comfort makes this choice unsatisfactory.

3. Fit the mask as follows:

WARNING - An improperly fitted mask could result in a loss of altitude protection and possible injury to the wearer.

a. Have the wearer don his/her flight helmet and ensure nape and chin straps are properly adjusted. If not, re-adjustment is essential to achieve proper mask seal.

NOTE - *Proper helmet fit is essential to ensure proper mask seal and comfort.*

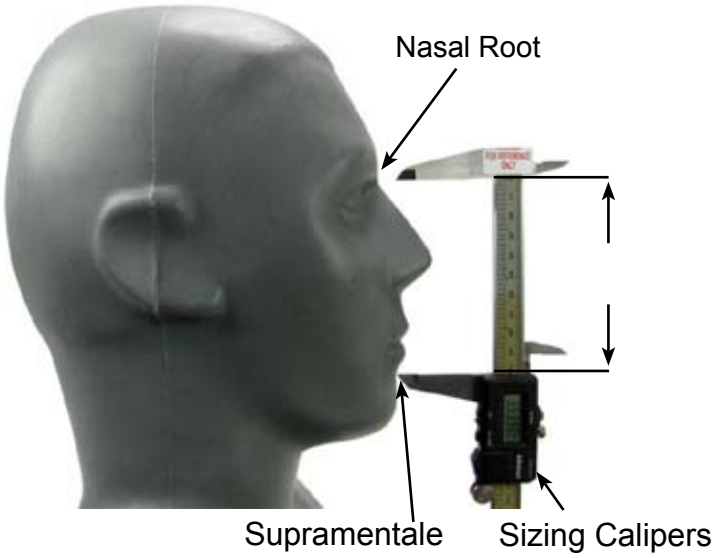
b. Measure eye center position to helmet edgeroll distance. Distances in excess of 64 mm (2½ inches) may result in mask seal difficulty and/or mask/visor interference problems (Ref. Figure 4-1b). (This reference refers to the 56P & 84P helmets only. Other helmets may have a slightly different measurement.)

c. If the wearer is required to wear eyeglasses, have them don their glasses during mask fitting.

Table 4-1

Mask Sizing Chart

Mask Size	Face Length A mm (inches)
Small Narrow	Lengths up to 86.99 (3.31-3.43)
Medium Narrow/Medium Wide	87 to 100 (3.43-3.94)
Large Wide	More than 100 (3.94)



Nasal Root = Deepest Impression of the Nose Line

Supramentale = Deepest Impression Between the Lower Lip and Chin

Figure 4-1a

Measuring Face Length

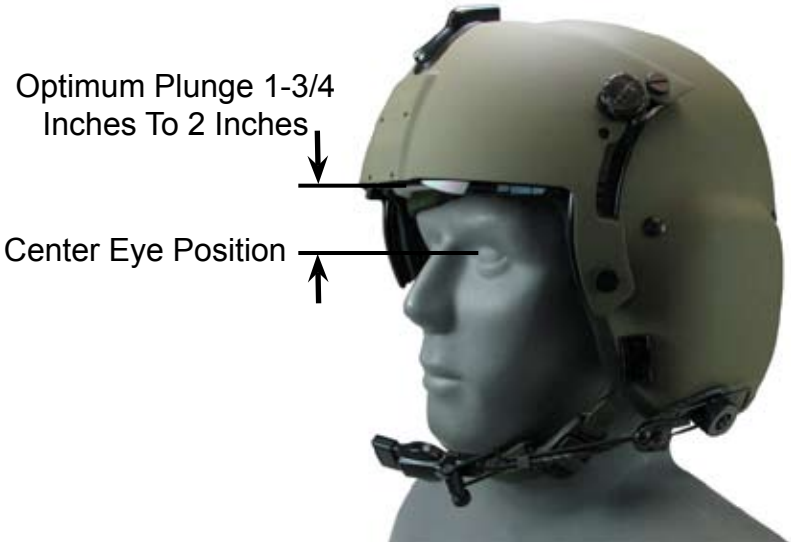


Figure 4-1b

Eye Center Position to Edgeroll

d. Loosen the four suspension straps on the mask and have the wearer position the mask comfortably and squarely on his/her face. Attach the mask via the supplied striker assemblies, to the maxillofacial support (MFS) mounts already installed on the helmet. Adjust the mask position as needed for a comfortable fit with even pressure on the face. If PHODS is to be worn with the MFS system, replace the standard striker plate present on the MFS with the PHODS striker and fit mask while worn under the MFS.

e. Gently tighten the upper and lower straps evenly to achieve a centered fit. Check that the height of the hardshell of the mask is approx. even with the wearers pupil, and that the straps are uniformly tightened. Check for twisting or bunching of the mask straps in the striker slots.

f. The oxygen mask striker receiver position on the helmet should be checked for correct orientation. The correct orientation prevents the mask straps from being twisted or bunched in the striker when installed on the receiver.

g. If the mask is not correctly positioned on the wearer's face after adjusting the straps, the helmet receivers will need to be repositioned. If the helmet receivers do not require further adjustment, proceed with remaining fitting step

h. Determine if there are any high pressure points. After the mask has been on for a few minutes, remove mask and look for signs of non-uniform pressure on the wearer's face. Re-adjust straps to obtain uniform fit as necessary.

i. If prominent cheek bone or eyeglass interference is preventing uniform pressure, especially in the nose/nasal root area, try the next smaller size mask and repeat steps (e) through (g). If the Wearer is wearing a large or medium wide mask and has a comfortable, stable fit, but has leaks in the cheek area, try a size small narrow or medium narrow mask.

j. If the above mask fitting procedures are unsuccessful, then hardshell trimming may be required to relieve excess pressure at the cheek bone or nasal root area (Ref. Figure 4-2). Refer to paragraph 4.5 for hardshell trimming procedures.

k. If the mask fitting sequence is successful, check the helmet visor lens and mask hardshell (interface) contact. The contours of both interfaces should fit together with little or no gap. If PHODS is to be worn with MFS, check visor fit with MFS. The installation of the PHODS should not impact fit & wear of the MFS.

l. If a successful mask fit is achieved, mark mask adjustment straps prior to testing the mask in accordance with paragraph 4.13.

> ☞ ***NOTE -*** *The buckles on the mask should be tacked to prevent movement. Tacking thread showing no wear between inspections is considered satisfactory.*

m. Ensure the microphone assembly is positioned inside the mask cavity to permit optimum communication.

NOTE - *Assuming that the mask is assigned to a single wearer, after the mask has been flown and a comfortable fit has been achieved, cut the excess strap length leaving not less than one inch and not more than three inches. Heat-sear the cut ends to prevent unraveling. The straps may be folded under if desired before tacking. Tack with two turns of thread. Tacking shall be of doubled waxed thread, Specification V-T-276, Type IV, Size B, ticket 8/4 (NSN 8310-01-063-5934) or equal. Make two turns through the adjustment buckle (Ref. Figure 4-2). Tie the tacking thread with a surgeon's knot and secure with a locking knot.*

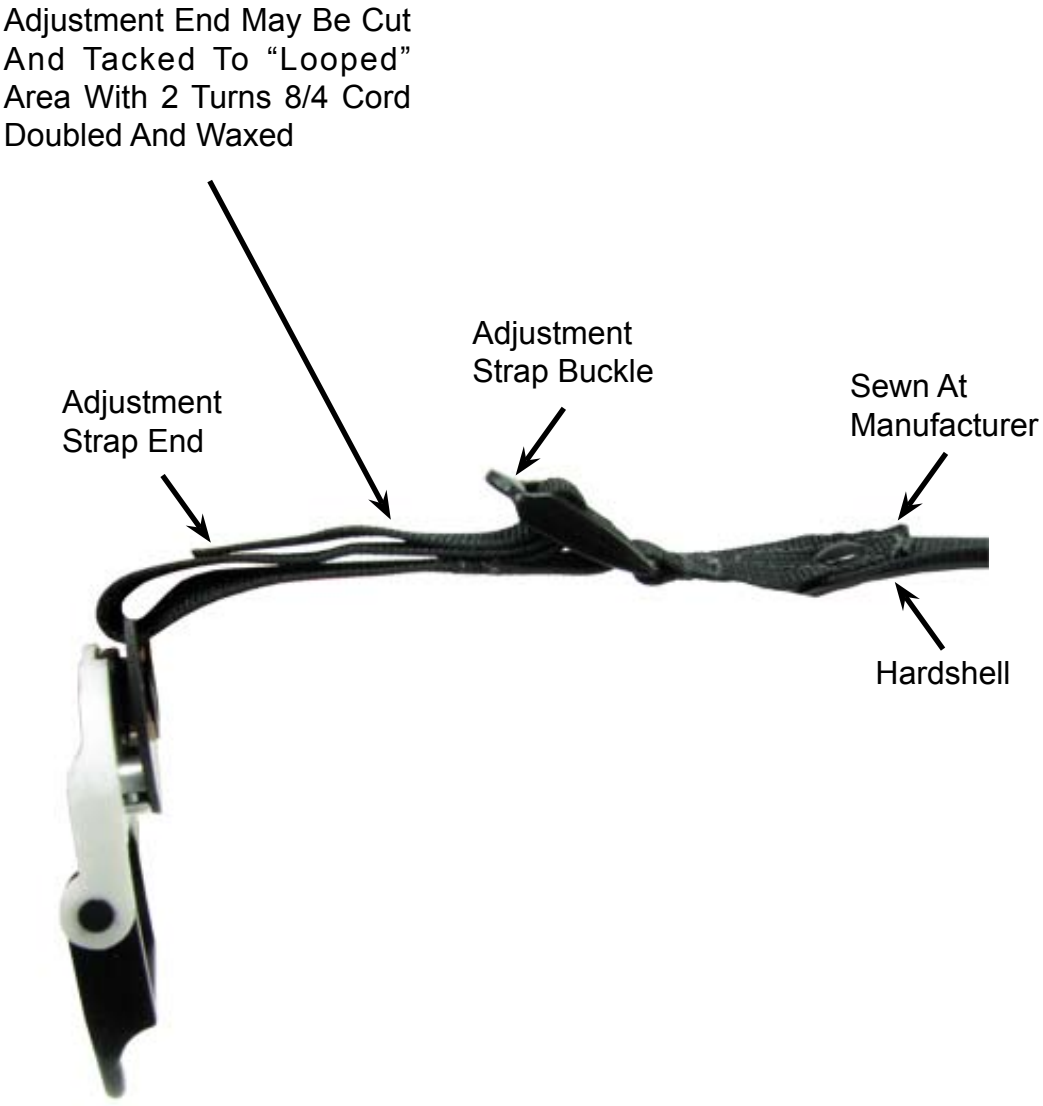


Figure 4-2

Tacking Mask Adjustment Straps

4.5 Hardshell Trimming

If hardshell trimming is required, remove the material as follows (Ref. Figure 4-3):

1. Mark the area of the hardshell requiring material removal. Do not remove any more material then is necessary to achieve a proper fit. In no case shall material be removed any closer than 6.4 mm (¼ inch) from the upper strap attachment slots or 9.5 mm (⅜ inch) from the valsalva ports.

2. Remove the microphone assembly per paragraph 5.5.

3. Remove the valves and 90 degree oxygen inlet fittings per paragraphs 5.5. Separate the facepiece from the hardshell.

4. Using a suitable hand file, carefully remove the material up to the reference line marked in step (a).

5. After completing the hardshell trimming, clean the hardshell with 70% isopropyl alcohol and let air dry.

6. Re-assemble the mask per paragraph 5.9.

7. Check the mask for proper fit (Ref. paragraph 4.4). If additional hardshell trimming is necessary, repeat steps (a) through (e) until a satisfactory fit is achieved.

8. Test the mask per paragraph 4.13.



Figure 4-3
Hardshell Trimming

4.6 Facepiece Trimming

If necessary for wearer comfort, the area of the facepiece under the chin may be trimmed as follows (Ref. Figure 4-4):

1. Mark the area of the facepiece requiring material removal. Maximum depth of trim area shall not exceed 12.7 mm (½ inch).

2. Using small scissors, remove the material up to the reference line marked in the above step. Blend the trimmed area with the contour of the facepiece edge to eliminate sharp corners. Cut edge should be as smooth as practical.

3. Clean the facepiece with 70% isopropyl alcohol solution and let air dry. Verify mask fit and seal.

4. Steps (1) through (3) may be repeated as necessary while staying within the 12.7 mm (½ inch) maximum depth requirement.

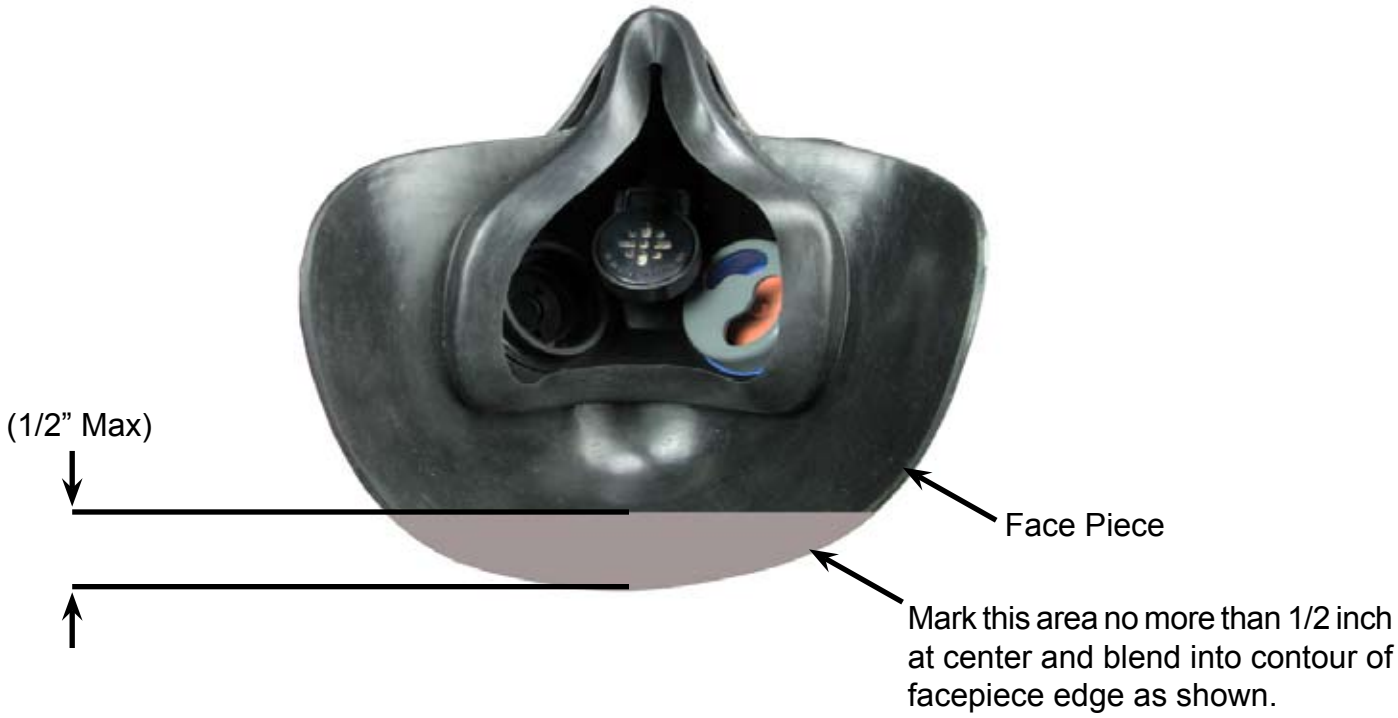


Figure 4-4

Facepiece Trimming

4.7 Installing MFS Strikers onto Flight Helmet

1. Remove the dual visor assembly from the helmet.
2. Set a compass to the value shown below for your helmet size.

Small, XS, XXS:	3-1/8 inches
Medium:	3-3/16 inches
Large:	3-19/64 inches
X-Large:	3-21/64 inches

3. With the compass set to the appropriate value as specified in Step 2, position the point of the compass in the dimple on one side of the helmet, and draw an arc from approximately 2 inches to 2-1/2 inches below the dual visor assembly post as shown in Figure 4-5.

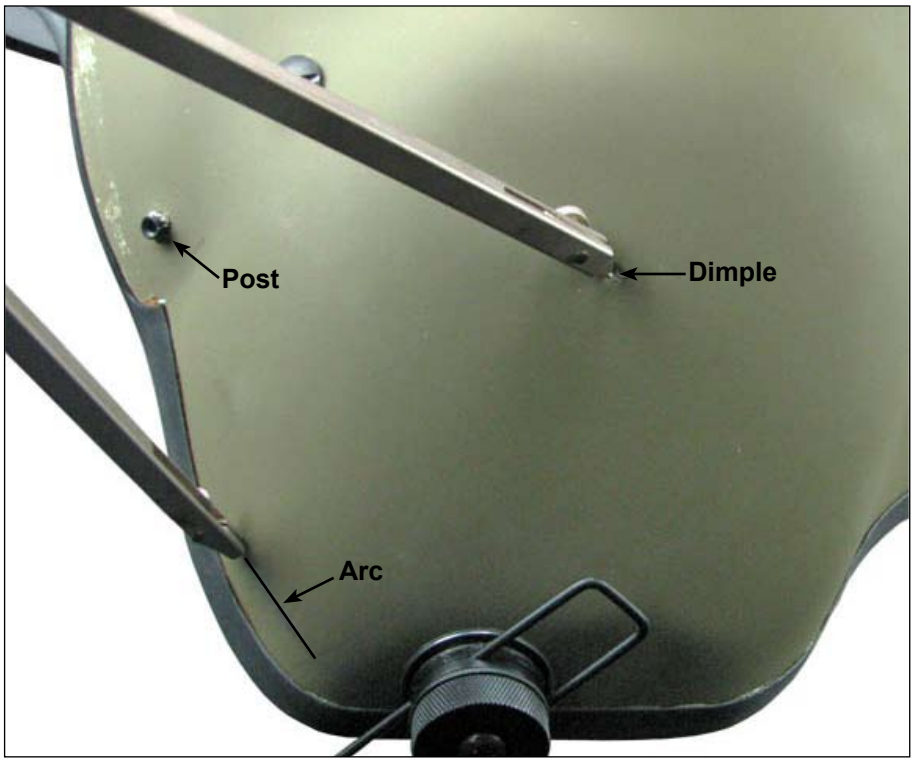


Figure 4-5
Drawing Arc from Helmet Dimple

4. Repeat Step 3 for the other side of the helmet.
5. Set the compass to the value shown below for your helmet.

Small, XS, XXS:	2-9/64 inches
Medium:	2-9/64 inches
Large:	2-5/32 inches
X-Large:	2-9/64 inches

6. With the compass set to the appropriate value as specified in Step 5, position the point of the compass below the lower dual visor assembly post on one side of the helmet, and draw an arc as shown in Figure 4-6 to intersect with the first arc.

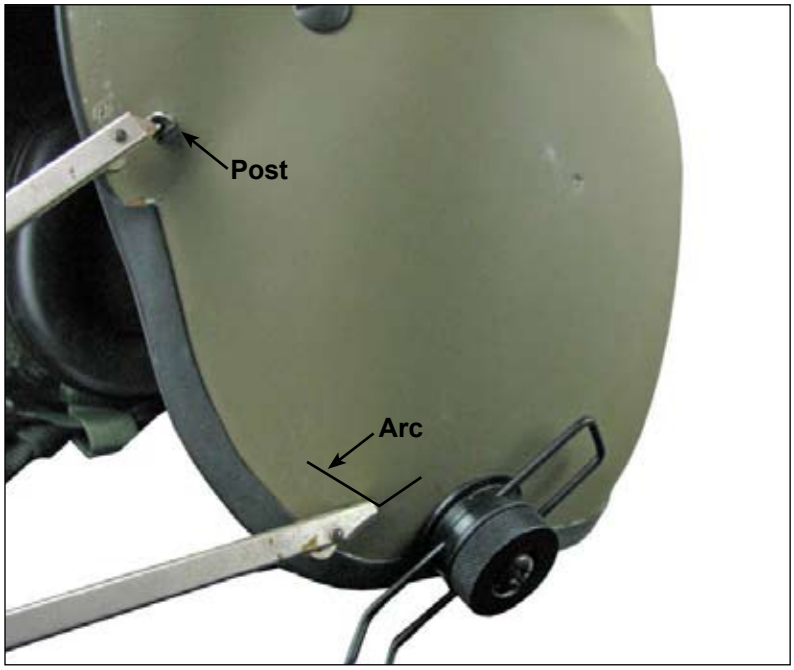


Figure 4-6

Drawing Arc from Dual Visor Assembly Post

7. Repeat Step 6 for the other side of the helmet.

8. On one side of the helmet, center punch the point at which the arcs intersect. Repeat for the other side.

WARNING - Wear eye-protective goggles when drilling holes in Steps 9-11 to prevent eye injury. Use the 2x4 block of wood as described in Steps 9-11 to prevent hand injury.

CAUTION - Be careful not to damage any components inside the helmet when performing Steps 9-11.

CAUTION - Be sure to drill the helmet shell as specified in Steps 9-11, or delamination of the helmet shell could result, making the helmet unserviceable. When performing Steps 9-11, hold the drill perpendicular to the helmet shell to prevent damage to the shell and the energy-absorbing liner. Use the 2x4 block of wood as specified in Steps 9-11 to prevent damage to the helmet shell.

9. On both sides of the helmet, at the center punched marks where the two arcs intersect, firmly hold a 2x4 block of wood inside the helmet shell behind the drilling point. Use a 1/16-inch drill bit to drill a pilot hole. Continue to hold the block in this manner in Steps 10 and 11.

10. Use a 9/64 drill bit to drill through the pilot hole.

11. Finish the hole with 3/16-inch drill bit.

12. Referring to Figure 4-7, attach a striker to one side of the helmet by using one screw and a post through the lower hole of the striker and the drilled hole in the helmet, applying a drop of white glue to the threads of each screw. Leave the screw just loose enough to allow the striker to rotate.

13. Repeat Step 12 for the other side of the helmet.

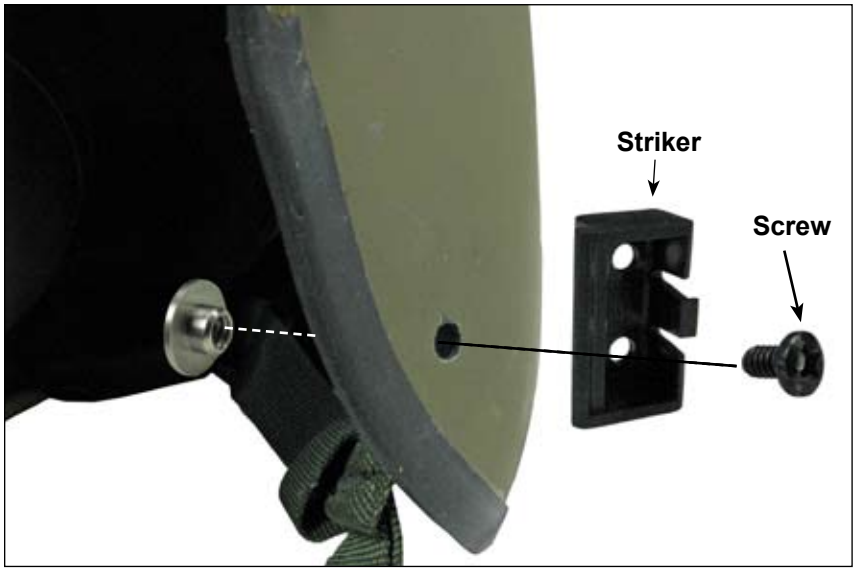


Figure 4-7

Striker Attachment

14. Reattach the dual visor assembly to the helmet. Referring to Figure 4-8, use the two downstop locking screws (one on each side of the visor) to adjust the visor downstop to the lowest position.

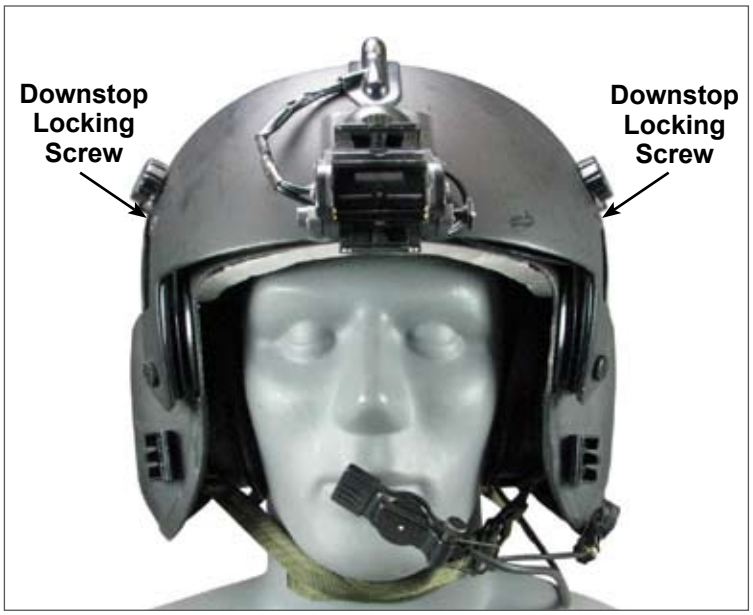


Figure 4-8

Downstop Locking Screws

15. Referring to Figure 4-9, attach the MFS to the striker and latch the MFS into place as follows: Position the pin on the MFS latch into the slot of the striker, and flip the latch against the helmet shell. Ensure that the latch is locked in place.

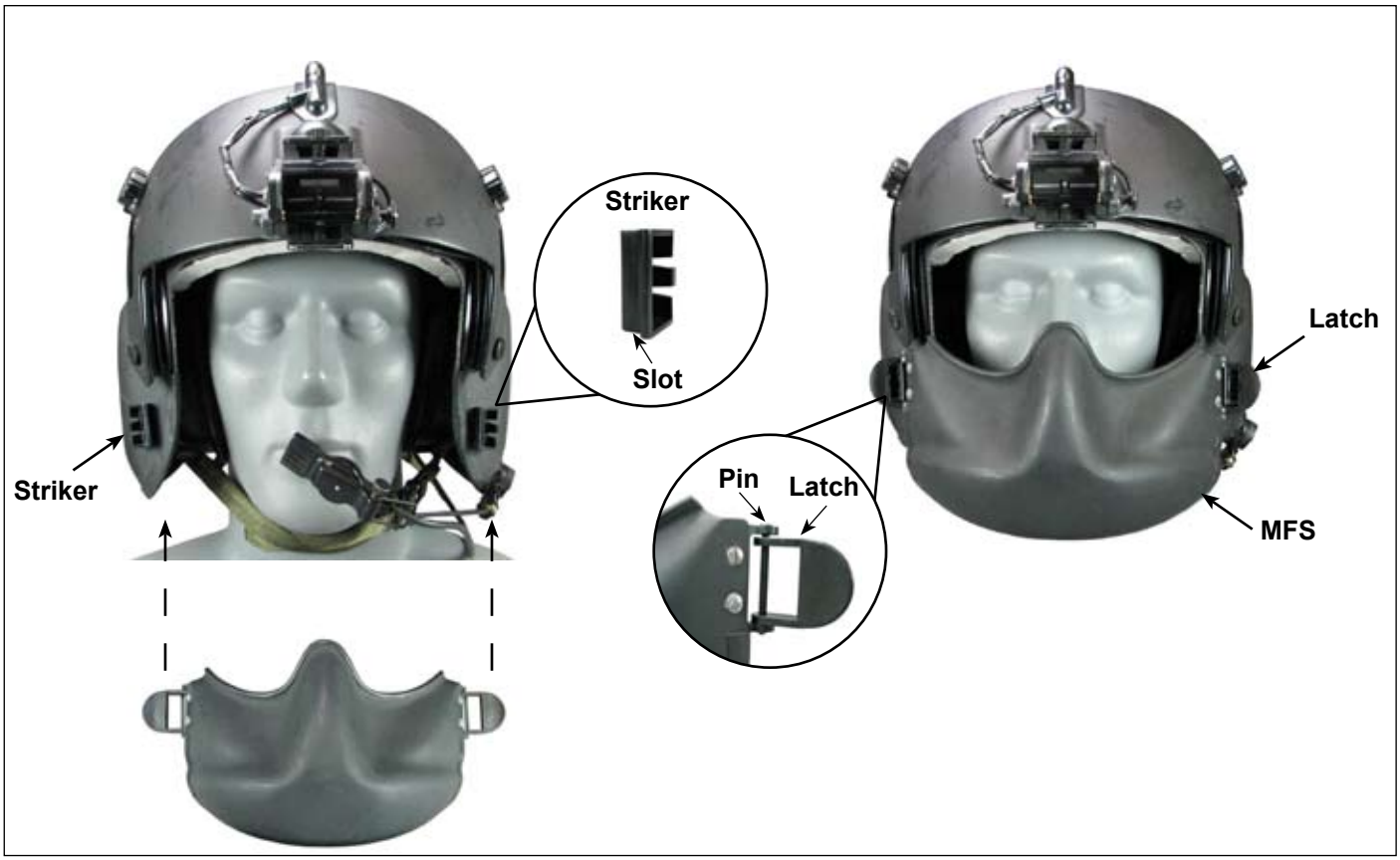


Figure 4-9

MFS Attachment to Helmet

> ***NOTE -*** *The helmet can be donned or doffed while the MFS is attached to either side and swung open. However, if the ML-24 light (from Seitz Scientific Industries, Inc.) is attached to the MFS, the MFS should be swung open from the right side as worn to avoid disconnecting the light. The MFS can also be swung open while the helmet is worn, allowing the crewmember to eat or drink. If the helmet is stowed with the MFS attached, the shield should be secured to the helmet on both sides.*

16. Swing the MFS to the closed position, and fasten the latch in place as described in Step 15.

17. Adjust the MFS position as follows:

    1. Lower the inner (clear) visor to the full down position.

    2. Push up or down on the MFS so that an even, approximately 1/16-inch clearance exists between the inside surface of the visor and the top edge beading of the MFS where they overlap. The bottom edge of the visor should align with the bottom edge of the edge beading on the MFS. The MFS must not touch any part of the dual visor housing.

    3. With the MFS in this position, snug the two lower striker screws.

18. Check the MFS position as follows:

a. Raise the inner visor.

b. Unlatch one side of the MFS and swing the MFS out, ensuring that there is no interference with dual visor assembly. Re-latch the MFS, and repeat for the other side.

c. Re-latch both sides of the MFS.

d. Lower the visor again to ensure that the alignment and clearance specified in Step q. has been maintained. Readjust as necessary.

e. Raise and lower the inner visor again to ensure clearance and proper operation.

f. Raise the visor again.

WARNING - Wear eye-protective goggles when drilling holes in Steps s and t to prevent eye injury. Use the 2x4 block of wood as described in Steps s and t to prevent hand injury.

CAUTION - Be careful not to damage any components inside the helmet when performing Steps s and t. Be sure to drill the helmet shell as specified in Steps 19 - 20, or delamination of the helmet shell could result, making the helmet unserviceable. When performing Steps 19 and 20, hold the drill perpendicular to the helmet shell to prevent damage to the shell and the energy-absorbing liner. Use the 2x4 block of wood as specified in Steps 19 and t to prevent damage to the helmet shell. When performing Step 20, ensure that both strikers are rotated out of the way before you begin drilling. Do not drill through the strikers with the 3/16-inch drill bit.

19. Drill the pilot holes as follows:

a. With both sides of the MFS latched in place and the two lower striker fasteners snug, firmly hold a 2x4 block of wood inside the helmet shell behind the drilling point.

b. Use a drill with a 1/16-inch drill bit to drill a pilot hole through the upper hole of both strikers.

c. Continue to hold the wood block behind the drilling point, and drill the upper hole of both strikers with a 9/64-inch drill bit.

20. Drill the final holes as follows:

a. Remove the MFS, loosen the two lower striker fasteners, and rotate both strikers out of the way to allow access to the pilot holes drilled in Step 19.

b. Firmly hold a 2x4 block of wood inside the helmet shell behind the drilling point.

c. Using a drill with a 3/16-inch drill bit, drill through both pilot holes.

21. Rotate the strikers back to their previous positions. Referring to Figure 4-10, install the remaining screws and posts through the upper striker holes and the newly drilled holes to attach the strikers, applying a drop of white glue to the threads of each screw. Tighten all four screws.

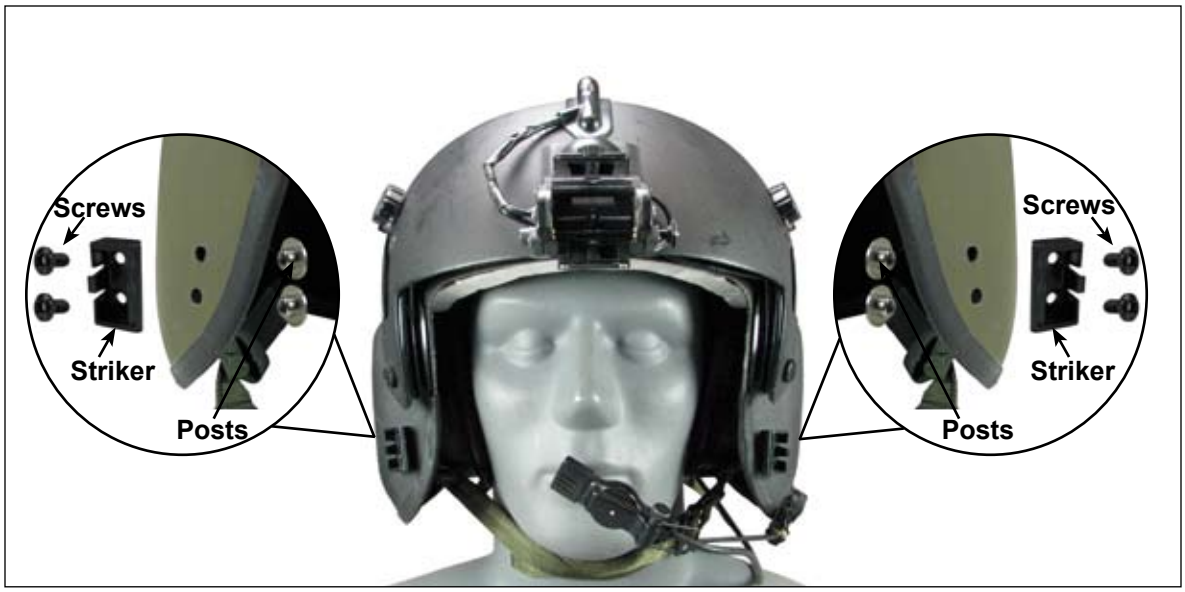


Figure 4-10

Striker Attachment Completion

22. Reattach the MFS, lower the inner visor, and check for proper alignment on the helmet. If the MFS does not align properly, loosen all four screws (with the MFS still attached), realign the MFS as necessary, and re-tighten the screws.

> ***NOTE -*** *Prior to donning the helmet in Step 23, clean the inside of the helmet to remove all debris resulting from drilling.*

23. Don the helmet and check the operation of the MFS.

24. Adjust the microphone boom as necessary so that it can be placed behind the MFS as shown in Figure 4-11 To do this, loosen the knurled knob on the boom swivel, move the boom forward or back until it can be placed into the recessed space of the MFS, and tighten the knurled knob.

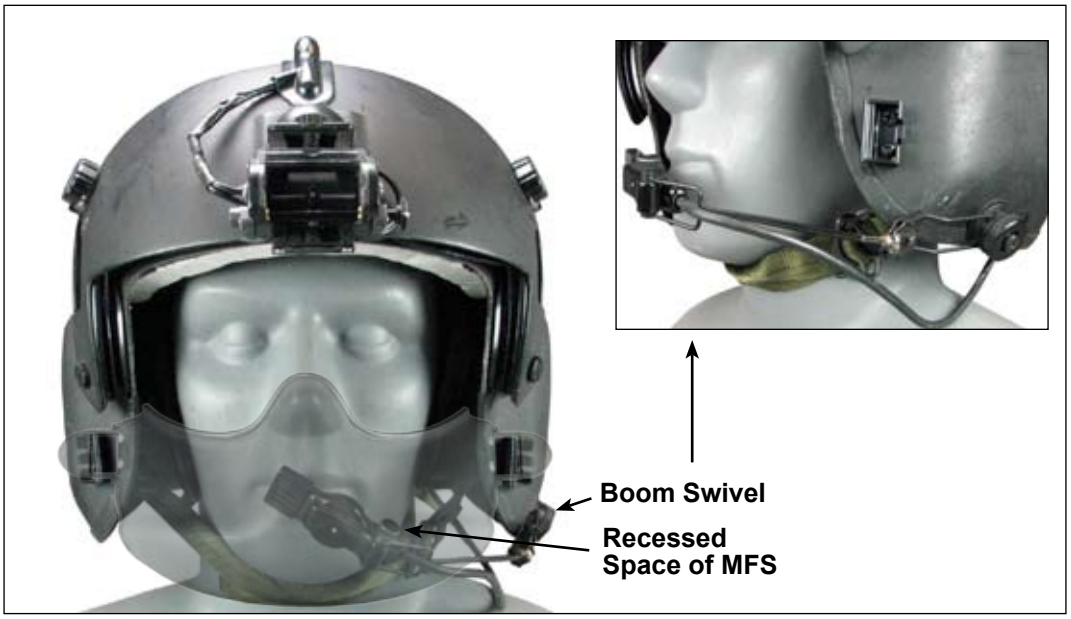


Figure 4-11

Boom Adjustment

4.7.1 Trimming MFS for ANVIS Compatibility

1. Have the crewmember don the helmet and attach the MFS.
2. Attach the night vision goggles to the ANVIS mount.
3. Remove the lens caps and lower the night vision goggles. If the goggles clear the MFS and are properly positioned over the eyes, no trimming is needed. If the goggles contact the shield, trim the shield as follows:
4. Mark a trim line on the shield by tracing along the edge of the goggles where they contact the shield. Figure 4-12 shows an example of areas to be trimmed on a shield.
5. Stow the goggles and remove the shield.

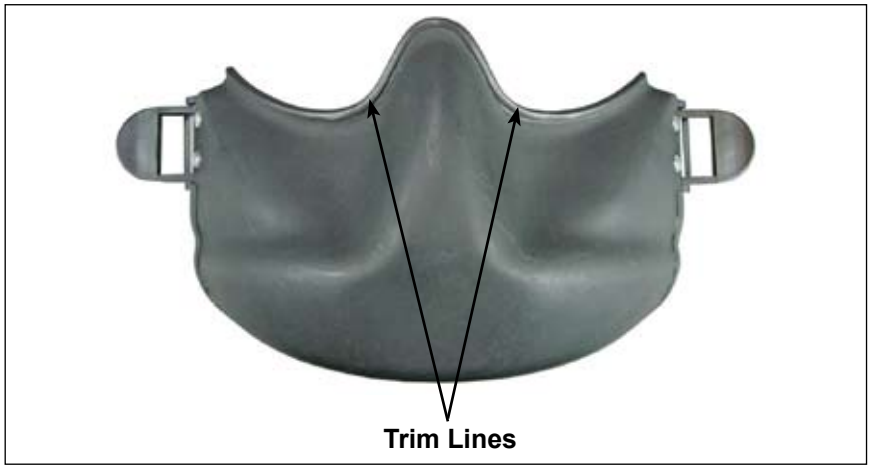


Figure 4-12

Areas to be Trimmed

WARNING - Wear eye-protective goggles when trimming the MFS, or chips of the MFS may injure the eyes. Wear a respirator when trimming the MFS, or harmful airborne particles may be inhaled.

NOTE - *Trim the MFS with the edge beading left in place. You will cut through the edge beading and the shield. Trim no more than necessary to allow the night vision goggles to clear the MFS.*

6. Using a rotary cutting tool, trim the shield along the marked trim line.

7. Reattach the shield and lower the night vision goggles. Ensure that the goggles clear the shield and are properly positioned over the eyes.

NOTE - *Replace the abrasive band of the sanding drum on the rotary tool as necessary.*

4.7.2 Operation

NOTE - *The helmet can be donned or doffed while the MFS is attached to either side and swung open. However, if the ML-24 light (from Seitz Scientific Industries, Inc.) is attached, the MFS should be swung open from the right side as worn to avoid disconnecting the light. The MFS can also be swung open while the helmet is worn, allowing the crewmember to eat or drink. If the helmet is stowed with the MFS attached, the shield should be secured to the helmet on both sides.*

4.7.3 Attaching MFS

1. Referring to Figure 4-13, position the pin on one side of the MFS into the slot of the striker, and flip the latch against the helmet shell. Ensure that the latch is locked in place.

2. Repeat for the other side.

3. Adjust the microphone boom as necessary so that it can be placed behind the MFS. To do this, loosen the knurled knob on the boom swivel, move the boom forward or back until it can be placed under the recessed area of the MFS, and tighten the knurled knob.

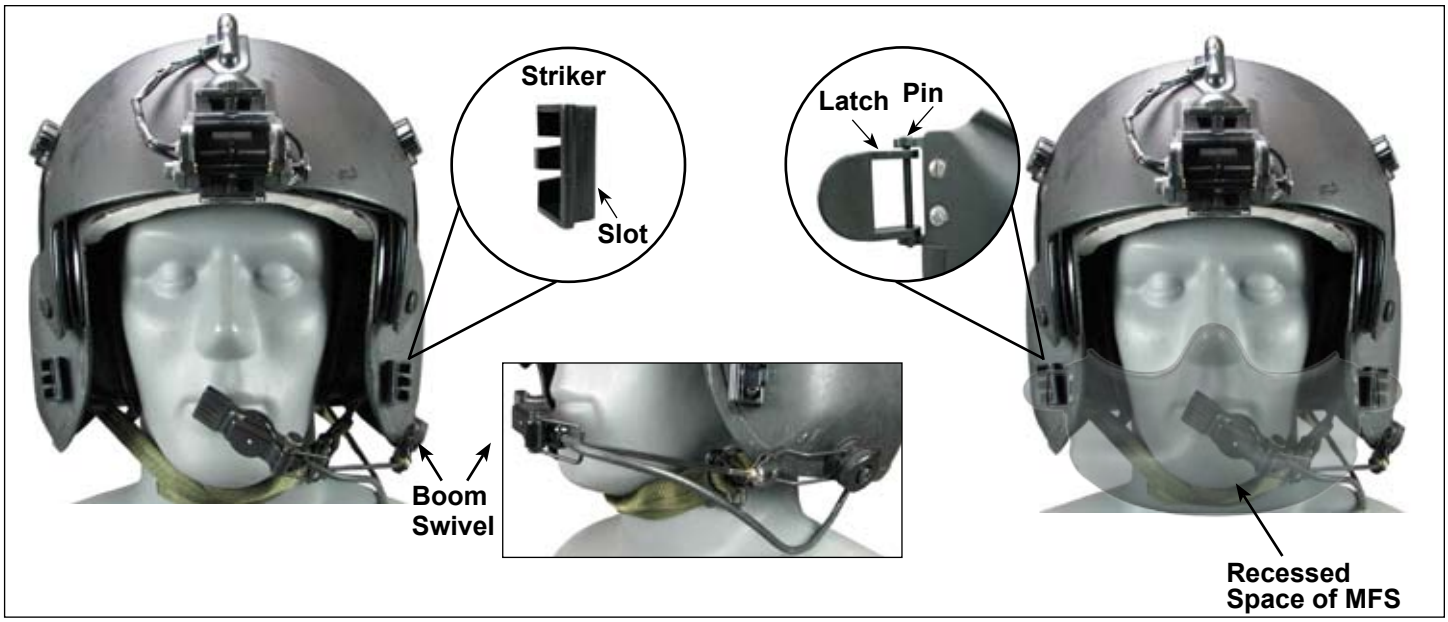


Figure 4-13

Securing MFS Attachment

4.7.4 Removing MFS

1. Flip the latch on one side of the MFS away from the helmet shell, and remove the pin from the slot.
2. Repeat for the other side.

4.7.5 Using Anti-Fogging Solution

WARNING - When using the anti-fogging solution described below, avoid getting the liquid solution into the eyes. Solution will irritate and may burn the eyes. In case of eye contact, flush with fresh water for 15 minutes. Contact physician if irritation persists. See package for other directions.

To help prevent the visor lenses from fogging when the MFS is worn, use Sea Drops™ anti-fogging solution as follows:

1. Apply two drops of anti-fogging solution to the inside surface of each lens.
2. Rub the solution over the entire surface of the lens.
3. Wait 10 seconds, then buff with a MicroNet™ microfiber cloth or any soft, dry cloth until the lens is clear. (Sea Drops™ and MicroNet™ are manufactured by McNett Corporation®, 1411 Meador Ave., Bellingham, WA 98229-5845, phone (360) 671-2227.)

4.7.6 MAINTENANCE

4.7.6.1 Repairing Edge Beading

a. Peel the worn edge beading away from the shield. (Figure 4-14 shows the location of the edge beading).

b. Remove old adhesive from the shield by rubbing it off with a clean cloth. Use a razor blade if necessary.

c. Coat the edge of the shield and the new edge beading with synthetic rubber adhesive.

d. Install the new edge beading evenly over the edge of the shield. Allow to dry. Cut off excess edge beading with shears.

e. Rub off any excess adhesive with a clean cloth.

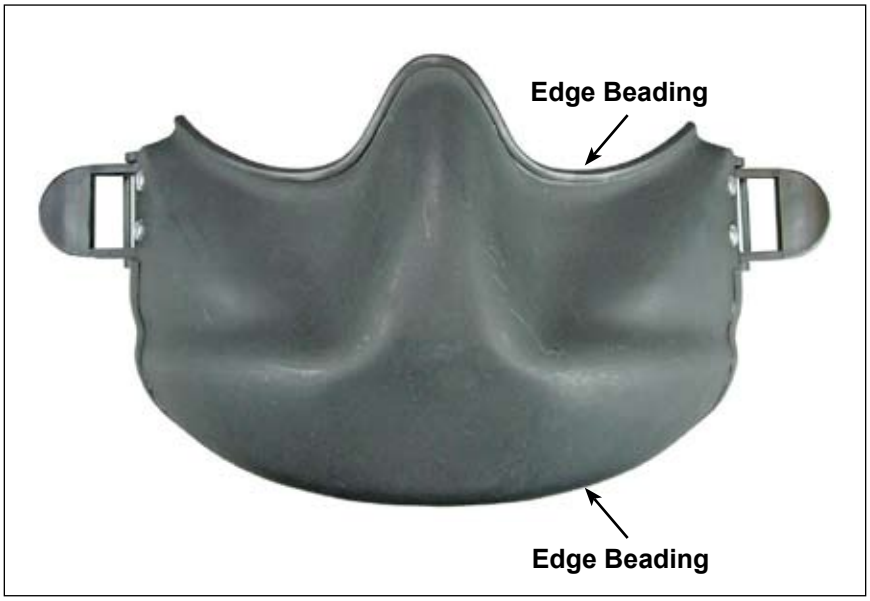


Figure 4-14

MFS Edge Beading

4.7.6.2 Replacing Striker

a. Referring to Figure 4-15, remove screws and posts attaching the striker to be replaced.

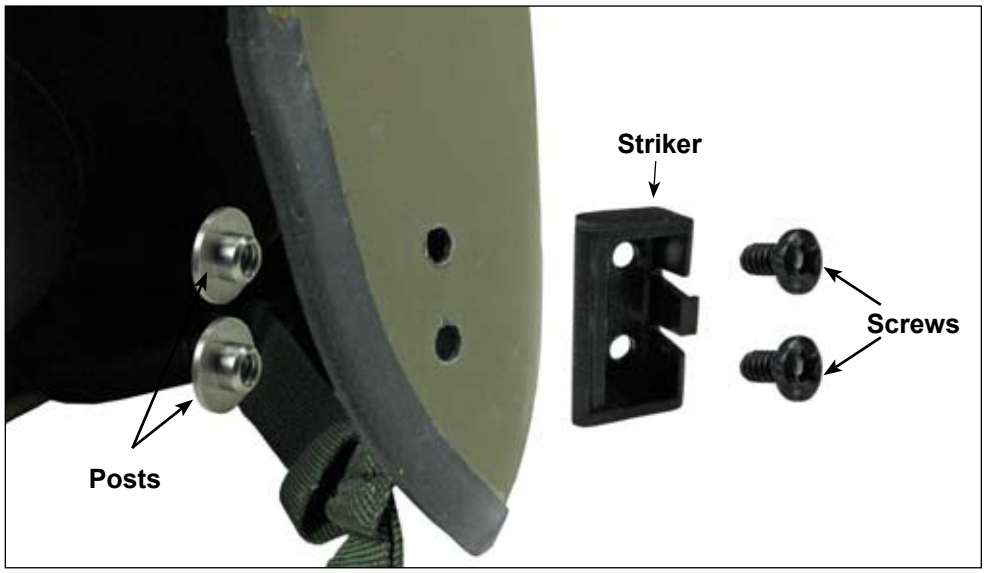


Figure 4-15.

Striker and Hardware

b. Install the new striker with the screws and posts (6-32 x 0.053”) supplied in the hardware kit, applying a drop of white glue to the threads of each screw.

4.7.6.3 Replacing Latch Assembly

a. Referring to Figure 4-16, remove the latch assembly by turning the quarter-turn fastener stud 1/4 turn. See pg.52 if replacement of the quarter-turn fastener stud is required.

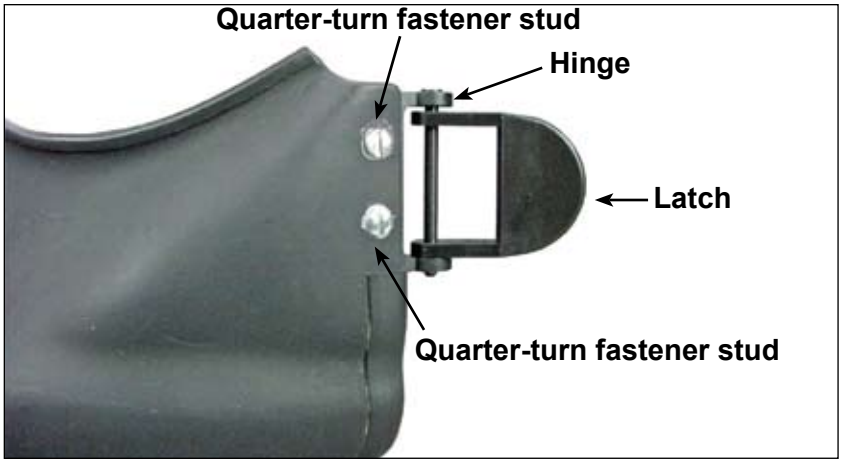


Figure 4-16

Latch and Hardware

b. Attach the replacement latch assembly to the shield with the quarter-turn fastener stud in the shield by aligning them with the holes in the latch assembly and turning them 1/4 turn. ***DO NOT OVERTIGHTEN!*** Damage to the retaining quarter-turn fastener stud ***will*** occur. See Figure 4-17.



Figure 4-17

Maxillofacial Shield Assembly

4.7.6.4 Cleaning MFS

Wipe with a clean cloth dampened with a mild soap solution.

4.8 Mask Adjustment and Testing

1. Upon achieving a good mask fit to the wearer, further adjustments and mask testing are required. Connect the PHODS Cylinder & Regulator to the OPC. Connect the OPC Hoses to the mask. Turn on the PHODS Regulator. Don the flight helmet and mask, switch the Oxygen Pulse Regulator to “R/M,” ensure that oxygen is flowing to the regulator and have wearer secure mask to face. Breathe normally and ensure proper operation of the Oxygen Pulse Regulator. Turn off the PHODS Regulator after testing.

2. Following any further mask adjustments after testing, cut excess length of mask adjustment straps, leaving between 25 and 75 mm (1 to 3 inches). Heat-sear cut ends of nylon mask straps to prevent fraying.

4.9 Inspection

Inspect the oxygen mask in accordance with paragraph 5.2 prior to placing it into service.

CAUTION - Dust and dirt can easily foul the operation of the valve assemblies. Keep the oxygen mask inside a sealed plastic bag or suitable container until ready for use.

4.10 Preflight

Wearers must perform the following prior to each flight.

1. Inspect condition of the mask and components for signs of damage.

2. Check communication system for proper operation on an approved test set.

3. If an unsatisfactory condition exists with the mask, consult your Aviation Life Support Equipment Technician.

4.11 Post flight

After the last flight of each day, oxygen masks should be stored in a designated area, such as the life support shop. Post flight inspection of masks must be performed as follows:

1. Verify that all components are properly secured.

2. Inspect all parts of the mask for wear, cracks, tears, or holes, and the presence of foreign matter. Give particular attention to the condition of fits and seals at any opening in the facepiece or oxygen delivery system that must hold pressure during operation.

3. Inspect oxygen mask valves (without removing from mask) for damaged parts. Inspect for any build-up of foreign matter on the valve plates. If valves are extremely dirty, remove per paragraph 5.5 and thoroughly clean per paragraph 5.6.

4. Inspect upper and lower straps and the rivets securing the lower straps to the hardshell, for evidence of frays or damaged material.

5. Clean and disinfect mask in accordance with paragraph 4.12.

WARNING - Disinfect oxygen mask after each use to avoid bacteriological contamination and to ensure maximum cleanliness.

4.12 Disinfection

1. Use gauze pads or other lint-free wipes moistened with 70% isopropyl alcohol to disinfect.

2. Disinfect the outside and inside of the oxygen mask. Be sure the disinfectant reaches all the areas that will come into contact with or be in the immediate area of the face.

3. Wipe surfaces until dry or allow to air dry.

4. Ensure that the mask is fully dry before placing into storage bag and container and returning to the aircrew member.

4.13 Mask Operation Checkout

Following post flight inspection, routine maintenance, or component replacement, a functional check of the mask should be accomplished by the Portable equipment technician.

1. Check for proper operation of the exhalation valve by breathing normally.

2. Verify the communication components are operating and sound is heard through the helmet earphones.

3. Following mask checkout, disinfect the mask per paragraph 4.12.

4.14 Microphone Assembly Adjustment

> ***NOTE -*** The 103022 thru 103025 masks use the modified M-169A/AIC 5-ohm microphone.

Refer to the following for informational guidance on how to achieve optimum voice and speech intelligibility performance of the mask-mounted microphone. This information applies to the GENTEX modified M-169A/AIC microphone (9).

1. When viewing into the internal mask cavity, the microphone element should have the word “FRONT” facing the aircrew member, indicating “talk side” (Ref. Figure 4-7a).

2. To achieve best operating performance, the microphone element should be positioned no more than 6.4 mm (¼ inch) away from the lips. Additionally, the element should be centered between the inhalation and exhalation valves (Ref. Figures 4-18 and 4-19).

3. Some wearers may experience slight discomfort if the microphone element is touching their lips and mouth. This can be remedied by moving the element from side to side within the mask cavity. Background noise may be picked up in the communication system if the element is placed directly over the inhalation or exhalation valve.

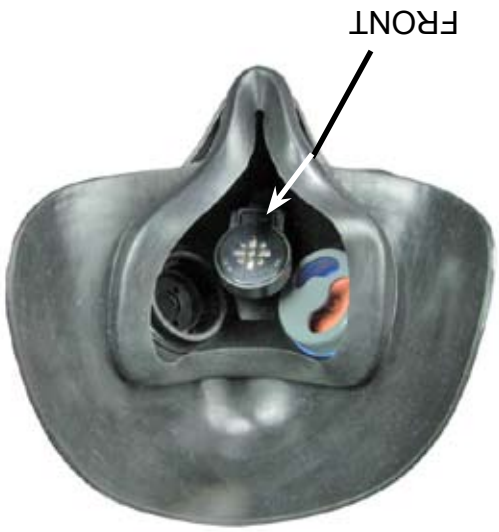


Figure 4-18
Microphone Assembly “Talk Side”
(Modified M-169A/AIC)



Figure 4-19
Microphone Assembly Positioning
(Modified M-169A/AIC Shown)

CHAPTER 5

PERIODIC MAINTENANCE

5.1 Introduction

This section contains instructions essential for organizational and intermediate maintenance of the oxygen mask. Refer to Chapter 2 for the special tools and test equipment required to facilitate maintenance.

5.2 Inspection and Preventative Maintenance

1. Perform the inspections listed in Table 5-1 each time the oxygen mask requires inspection.

2. Wearer should verify that their oxygen mask has been cleaned, inspected, and repaired as necessary by qualified technicians within the last 30 days prior to flight.

3. It is not necessary to completely disassemble the mask assembly every 30 days. Some masks may require disassembly and cleaning after every use (severe conditions), while others may not require washing for longer periods of time. Masks used very infrequently should not require frequent disassembly. The frequency of disassembly for cleaning is left to the discretion of the Aviation Life Support Technicians.

Table 5-1

Inspection and Maintenance Criteria

Step	Nomenclature	Inspect For	Repair
1.	Exhalation Valve or Inhalation Valve	Correct installation and operation, damage , foreign matter	Clean or replace as necessary
2.	Microphone	Damage, cracks, loose connections, proper seating	Tighten or replace as necessary
3.	Hardshell assembly	Cracks or breaks, damaged webbing, straps, buckles or rivets	Replace upper strap assembly, replace hardshell assembly
4.	Facepiece	Damaged, torn or punctured, stained or dirty	Replace or clean as necessary
5.	Quick Change Striker assemblies	Evidence of damage, separation or loose rivets, proper operation	Replace
6.	Valve covers	Tears, deformation, damaged plastic disk	Replace
7.	Straps and buckles	Frays, split, broken	Replace

5.3 Troubleshooting

Table 5-2 lists the most common problems that can occur in the oxygen mask along with probable causes of malfunction and recommended corrective actions.

Table 5-2

Troubleshooting

Item	Problem	Probable Causes	Remedy
1.	Leakage from facepiece	Loose fit	Adjust mask straps per Para. 4.4
		Improper size	Refit to a new mask size per Para. 4.4
2.	Leakage at microphone assembly	Loose/stripped screws	Tighten or replace screws/microphone
		Defective microphone sealing gasket	Replace
3.	Leakage around valves	Loose or improperly seated nut	Tighten nut per Para. 5.9
		Valve not properly seated in facepiece/hardshell port	Remove and reinstall valve per Para. 5.5 and 5.9
		Valve plate dirty	Clean plate per Para. 5.8
4.	Breathing is difficult or exhalation valve sticks	Severe contamination of exhalation valve flapper	Replace valve per Para. 5.5 and 5.9
5.	Communications difficult or impossible	Defective microphone	Replace components per Para. 5.5 and 5.9
		Defective comm. cable	
6.	Torn or punctured rubber faceseal	Improper storage; worn or dropped mask	Replace facepiece per Para. 5.5 and 5.9
7.	Cracked hardshell	Improper storage; worn or dropped mask	Replace hardshell assembly per Para. 5.5 and 5.9
8.	Hardshell straps	Frayed	See Para. 5.4
9.	Valve assemblies not functioning	Dirt, foreign object lodged in valve, damaged	Clean or replace valve
10.	PHODS Hose will not stay in mask connector	Connector worn	Replace 90° PHODS elbow connector (pg 104)

5.4 Hardshell Repair

None of the components are field repairable except for the hardshell assembly. Removal and replacement of other components is determined by the inspection (Ref. Table 5-1) or troubleshooting (Ref. Table 5-2) guides.

1. Repairing the hardshell assembly is limited to replacing the upper strap assemblies.

2. To replace damaged upper straps, remove damaged straps by unthreading from the hardshell and installing the replacement strap(s). Reference Figure 4-2 for strap routing.

5.5 Mask Disassembly

1. Organizational maintenance of the oxygen mask is limited to removal of damaged or defective parts and the removal of parts which must be detached to gain access to areas requiring cleaning and inspection.

2. Disassemble the mask in the sequence listed below. Key numbers refer to the parts location illustrations, Figure 7-1, unless otherwise noted.

3. Remove microphone (9) from mask by loosening the two screws (Ref. Figure 5-1). Pay careful attention not to lose the thin Mylar gasket that is located on the microphone mounting block.



Figure 5-1

Modified M-169A/AIC Dynamic Assembly

4. Remove exhalation / inhalation valve covers (14) by gently pulling off. The valve nut is recessed to capture the cover against the hardshell (5). Use large end of valve wrench to unscrew and remove both the exhalation and inhalation valve nuts.

5. Remove both valve bodies (9 & 10) from inside the mask by gently pulling them straight out from the inside.

6. Remove the 90° PHODS elbow connector from the mask as follows (Ref. figure 5-2):

a. Using the 17mm wrench to hold the inside nut(16), turn the outside nut (15) with the 17mm wrench until the nuts separate.

b. Remove the washer (18) from inside the mask.

c. Remove the 90° PHODS elbow connector from the mask.

d. Separate facepiece (1) from hardshell (5).

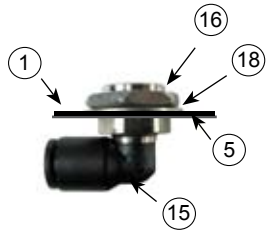


Figure 5-2
90° PHODS elbow connector

NOTE - Removal of Quick Change Striker assemblies during periodic maintenance is not necessary unless part replacement is required.

6. Remove Quick Change Striker Assemblies (32) from upper hardshell straps and lower straps assembly by cutting tacking (if tacking is present) and unlacing the free end of strap through each buckle. Removal of Quick Change Striker Assemblies during periodic maintenance is not necessary unless part replacement is required.

5.6 General Cleaning Instructions

WARNING - DO NOT use clothes washing detergents of any kind, i.e., Tide®, Cheer®, or All® for cleaning oxygen masks. Isopropyl alcohol may be used only where, and as, specified in this document.

DO NOT use automatic dishwashing liquids or crystals of any kind.

DO NOT under any circumstances use any organic solvent (Methylethylketone (MEK), Trichloroethylene (TCE), etc.) to clean any portion of the mask or valves or other components.

DO NOT turn facepiece inside out during cleaning.

AVOID soaking straps on hardshell. After the mask is assembled, disinfect the mask per paragraph 4.12.

WARNING - Isopropyl alcohol is flammable. Keep away from heat, sparks, and open flames. Use with adequate ventilation. Avoid eye and repeated skin contact. Avoid prolonged breathing of vapors. Keep container closed when not in use.

5.7 Cleaning Hardshell and Facepiece

1. Moisten a gauze pad with a solution of warm water and a mild liquid dishwashing detergent (NSN 7930-00-764-5076). After washing the facepiece thoroughly, rinse with warm water. A residual odor of the perfume may be present in the mask. If an allergy or objections to the odor should occur, change the detergent. Wipe inside and outside surfaces of the hardshell completely. Wipe with clean gauze pad.

2. After parts are dry, disinfect facepiece by dampening a gauze pad, or other lint-free wipe, with a 70% solution of isopropyl alcohol and allow to air dry. Be certain disinfectant reaches inner crevices of the facepiece.

5.8 Cleaning Valve Assemblies

1. Obtain two small containers large enough to partially submerge each valve.

2. Fill one container partially with a 70% solution of isopropyl alcohol or a mild solution of dishwashing detergent and water.

3. Fill one container with clean water.

CAUTION - DO NOT probe into any portion of the valves with swabs or other tools.

CAUTION - DO NOT under any circumstances use any type of organic solvent (MEK, TCE, etc.) to clean any portion of the mask, valves, or other components.

WARNING - Isopropyl alcohol is flammable. Keep away from heat, sparks and open flames. Use with adequate ventilation. Avoid eye and repeated skin contact. Avoid prolonged breathing of vapors. Keep container closed when not in use.

4. Hold base portion of the valve assemblies and gently swish in the container filled with cleaning solution. Normally, only a few seconds are required to remove stains and residue. Use a gauze pad or other lint-free wipe moistened with the solution and wipe the valve nuts and valve threads until they are clean.

5. Gently rinse the valves by swishing in the container of clean water.

6. Use a cotton swab lightly saturated in 70% Isopropyl alcohol if needed to remove stubborn residue. Lightly rub the exhalation plate of the exhalation valve and the anti-suffocation valve poppet.

7. Gently shake excess fluids from the valves and let air dry until residual alcohol and water have fully evaporated.

5.9 Mask Re-assembly (Ref. Figures 7-1/ & 7-2)

NOTE - Ensure exhalation valve (6) is returned to the proper hole of the facepiece. Valve should be opposite from PHODS OPC inlet fitting (D) in use.The soft rubber facepiece (2) acts as the gasket for sealing the valve. Ensure the facepiece material is not pinched between the valve threads and the hardshell (3).

CAUTION - Carefully align slots on the valve with the two small key tabs on the hardshell port. Damage can occur if not done properly.

1. Insert facepiece (2) into hardshell assembly (3) and align valve holes.

2. Taking note of aligning keyways, insert the threaded part of the exhalation valve (6) through the mask from the inside, ensuring that the hole in the facepiece (2) and hardshell assembly (3) are properly aligned. Ensure the facepeice is properly captured under the valve body in the grooves provided.

3. Place exhalation valve nut (7), with small diameter towards the hardshell (3), on the threaded part of the exhalation valve body (6). Tighten nut using valve wrench. Ensure that valve remains centered in the facepiece inlet port during installation, and that the valve nut is not excessively tightened.

4. Repeat step 3 & 4 for the installation process of the inhalation valve.

5. Install the PHODS elbow connector through the mask as follows:

   a. Put one drop of Locktite, #242 on the threads of the Elbow (15) and insert the Elbow (15) through the mask.

   b. Place the Washer (34) over the exposed threads of the Elbow (15).

   c. Thread the Nut (16) onto the exposed threads of the Elbow (15) with the shoulder down. Using the 13 mm and 17 mm wrenches in the PHODS Tool Kit (PN 102968) tighten wrench tight. DO NOT overtighten. This will ensure the fitting is centered and sealed to the mask.

   d. Repeat steps a-c for the remaining Elbow assembly.

   e. Insert the Red GMM Plug (13) into the Elbow (15) not in use. This will ensure the opening remains free of contaminates.

> ***NOTE -*** Ensure that the valve covers are properly installed on the valve nuts. An improperly installed valve cover may cause the cover to separate from the valve nut.

6. Install the valve covers (14) by placing them over the valve nuts and work to secure the fit. Ensure that the cover fully engages the lock nut. Ensure that the openings in the cover are oriented downward and that the cover is completely seated over the flat of the nut.

7. If installing the Modified M-169A/AIC microphone assembly proceed as follows:

   a. Place the Mylar gasket over the two male pin connectors on the microphone element block and insert the element inside the mask.

   b. Ensure the silicone rubber sealing gasket is attached to the microphone receptacle.

   c. Place the receptacle on the outside of the mask and line up the pins and install the two screws.

   d. Hand-tighten screws sufficiently but be careful to avoid stripping threads.

8. If applicable, re-attach Spreadre Bar Assemblies (10, 11) to hardshell upper strap (5) and lower strap (4), if removed for part replacement.

9. Refit the mask to the wearer and test mask per paragraph 4.4. Retack the mask straps following fitting per paragraph 4.4.

10. When mask re-assembly is complete, test the mask per paragraph 4.13 and disinfect per paragraph 4.12.

CHAPTER 6
PARTS LIST

6.1 Sizes Covered

This parts list is applicable to the following sizes of PHODS :

Size
Small Narrow (SN)
Medium Narrow (MN)
Medium Wide (MW)
Large Wide (LW)

CHAPTER 7
ILLUSTRATED PARTS BREAKDOWN

7.1 Listing of Similar Assemblies

The sizes of the PHODS have been combined and listed as follows:

All the assemblies (figure and index numbers, part numbers, descriptions, quantities, codes) are listed first, followed by the detail parts.

A part common to all sizes in the same quantity is listed once.

A part common to all assemblies in differing quantities is listed once for each quantity and is identified to which assembly each listing pertains to by means of “Useable on Codes.”

Peculiar parts are listed once and are identified to which assembly each pertains. Listed assemblies and parts are the latest available at the time of publication.

7.2 Usable On Codes

The following usable on codes are used in the parts list:

1030XX/1029XX PHODS OXYGEN MASK

CODE	USED-ON END ITEM
A	103022
B	103023
C	103024
D	103025
E	103025
F	103027
G	103028
H	103029
I	102971
J	102972
K	102973
L	102974

7.3 Maintenance Parts List

The Maintenance Parts List (MPL) as shown in Table 7-1 covers both the version of the PHODS used with the HGU-84/P helmet (See Figure 7-1) and the version of the PHODs used with the HGU-56/P helmet (See Figure 7-2).

Table 7-1

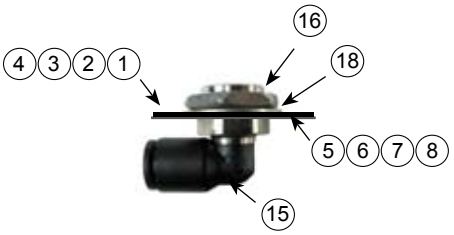
Maintenance Parts List

Index No.	Part No	Description	Qty Per Mask.	Use On Code
-1	103030	Facepiece (SN)	1	A, E, I
-2	103031	Facepiece (MN)	1	B, F, J
-3	103032	Facepiece (MW)	1	C, G, K
-4	103033	Facepiece (LW)	1	D, H, L
-5	103034	Hardshell Assy. (SN)	1	A, E, I
-6	103035	Hardshell Assy. (MN)	1	B, F, J
-7	103036	Hardshell Assy. (MW)	1	C, G, K
-8	103037	Hardshell Assy. (LW)	1	D, H, L
-9	102983	Inhalation Valve Assembly	1	A-L
-10	102982	Exhalation Valve Assembly	1	A-L
B	102981	Microphone Assembly, M-169A/AIC Modified	1	A-L
-12	103038	Snap Adaptor	2	A-D
-13	102979*	Plug, GMM (part of 103043)	1	A-L
-14	102978	Cap, Exhalation/Inhalation Valve	2	A-L
-15	102977*	Elbow, Q. D., 6mm w/o-ring (part of 103043)	2	A-L
-16	102976*	Nut, Hex, M10-1, Modified (part of 103043)	2	A-L
-17	11026*	Loctite, #242 (used on 103043)	N/A	A-L
-18	103042	Washer* (part of 103043)	2	A-L
A	103043*	Kit,PHODS Mask,Elbow Fitting	2	A-L
-30	103039	Spreader Bar Assembly, Left (w/ Mask kit)	1	A-L
-31	103040	Spreader Bar Assembly, Right (w/ Mask kit)	1	A-L
-32	103041	Kit,Face Shield Hardware,PHODS (102971)	1	I - L
-33	102984	Kit,Mask Hardware,PHODS	1	I - L
N/S	103050	Kit, PHODS Mask to MFS (4 quarter turn posts & split washers)	4	
N/S	103051	Facial Shield, PHODS (MFS)		
N/S	103052	Kit, Striker, MFS, PHODS		

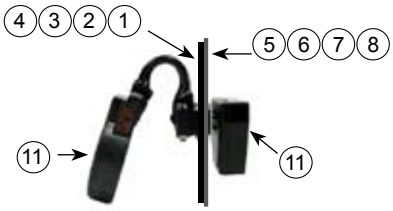
N/S - Not Shown



103022 Small Narrow
103023 Medium Narrow
103024 Medium Wide
103025 Large Wide



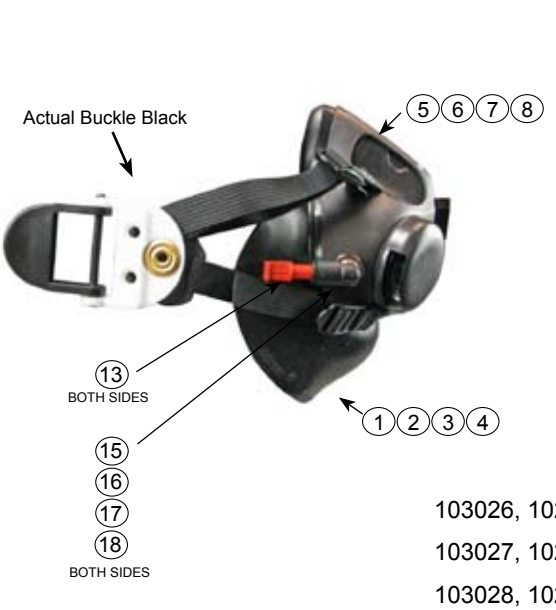
Close-up A
90° PHODS Elbow Connector

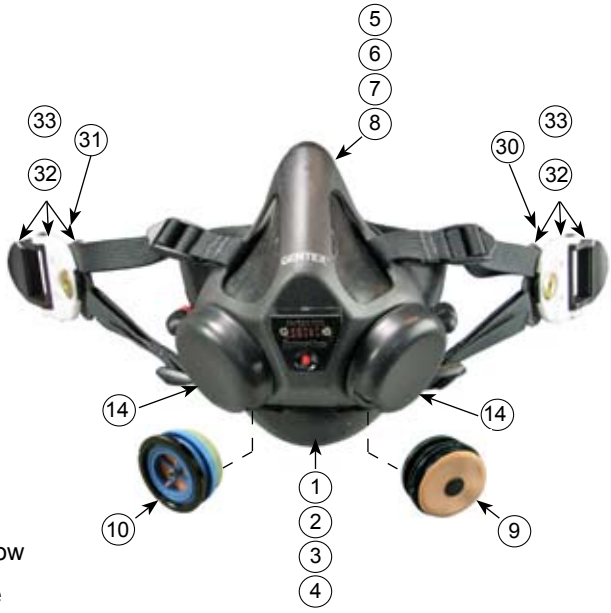


Close-up B
Microphone Assy Attachment

Figure 7-1

PHODS Oxygen Mask, HGU-84/P





103026, 102971 Small Narrow
103027, 102972 Medium Narrow
103028, 102973 Medium Wide
103029, 102974 Large Wide

Figure 7-2

PHODS Oxygen Mask, HGU-56/P Usage, Parts Location

Maintenance Notes

Maintenance Notes

PHODS

Portable Helicopter Oxygen Delivery System

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Literature P/N 103047 Rev. 01/11